Journal of the Royal Society of Arts

NO. 5024 JULY 1958 VOL. CVI

ANNUAL GENERAL MEETING

The Council hereby gives notice that, in accordance with the Bye-Laws, the Two Hundred and Fourth Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statements for 1957, and for the election of officers, will be held on Wednesday, 25th June, 1958, at 3 p.m. at the Society's House.

(By Order of the Council)

KENNETH WILLIAM LUCKHURST,
Secretary.

BICENTENARY MEDAL

The Council have awarded the Bicentenary Medal for 1958 to Mr. John Gloag, a Member of the Council of the Society.

Mr. Gloag, who was born in 1896, is a Director of F. C. Pritchard, Wood and Partners, the well-known firm of advertising agents. As a young man he was for some years Art Editor, and later Editor, of *The Cabinet Maker*. From 1936–8 he was Public Relations Director of the Timber Development Association. A versatile and accomplished author, he has written many books, and has made especially distinguished contributions to the literature of furniture, and industrial and architectural design and history. His books include *Industrial Art Explained* (1934), *The Missing Technician in Industrial Production* (1944), *The English Tradition in Design* (1947), *A Short Dictionary of Furniture* (1952)—a compilation of great practical use and interest—*Georgian Grace : A Social History of Design*, 1660–1830 (1956, reviewed in the *Journal*, 1st March, 1957, p. 302) and *Guide to Western Architecture* (1957, see page 634 of this issue).

Mr. Gloag has brought a lively and critical mind and pen to the development of industrial design for upwards of thirty years. His work in the fields of architecture and of design has been recognized by his appointments as an Honorary Associate of the Royal Institute of British Architects, and an Honorary Fellow of the Society of Industrial Artists. Mr. Gloag has been very actively associated with the work of the Design and Industries Association; he was also a member of the Council of Industrial Design from 1949 to 1955. He has contributed several notable papers, on aspects of industrial design, to this Society's Proceedings, and his experience, taste and knowledge have been of great value to the work of the Industrial Art Bursaries Board, on which he has served since 1948.

INDUSTRIAL ART BURSARIES EXHIBITION

As announced in the last issue of the *Journal*, the exhibition of designs submitted in the 1957 Industrial Art Bursaries Competition will be open at the High Wycombe College of Further Education from 26th June to 11th July.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 9th June, 1957. Present: Sir Alfred Bossom (in the Chair); Mrs. Mary Adams; Dr. W. Greenhouse Allt; The Honble. G. C. H. Chubb; Sir Edward Crowe; Sir Ernest Goodale; Sir William Halcrow; Mr. A. C. Hartley; Dr. R. W. Holland; Lord Latham; Mr. Edgar E. Lawley; Mr. F. A. Mercer; Lord Nathan; Sir Selwyn Selwyn-Clarke; Dr. L. Dudley Stamp; Sir Stephen Tallents; Professor S. Tolansky; Sir Griffith Williams, and Miss Anna Zinkeisen; with Dr. K. W. Luckhurst (Secretary) and Mr. J. S. Skidmore (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Ashman, Mrs. Nora Alice, Indianapolis, Indiana, U.S.A.
Baker, John Hopkinson, A.B., New York, U.S.A.
Briggs, Stephen Foster, B.S., E.D., Naples, Florida, U.S.A.
Catterall, John, N.D.D., Sheffield, Yorks.
Clarke, Colonel Sir Ralph Stephenson, K.B.E., T.D., D.L., Haywards Heath, Sussex.
Cookson, Eric Stephen, Burnley, Lancs.
Dangerfield, Mrs. Elma Tryphosa, London.
Dunlop, Roy Arthur, A.T.D., Bideford, North Devon.
Edwards, Sir George Robert, C.B.E., Great Bookham, Surrey.
Farr, Noël Anthony, M.S.I.A., London.
Fleischmann, Julius, B.S., Cincinnati, Ohio, U.S.A.
Goethe, Charles M., M.S., LL.D., Sacramento, California, U.S.A.
Gray, Gordon, Riverside, Ontario, Canada.
Green, William, M.A., Jackson Heights, New York, U.S.A.
Hemingway, Robert Jess, Preston, Lancs.
Henthorne, Leslie Stapleton, A.F.R.Ae.S., London.
Kay, Eric George, A.T.D., Halifax, Yorks.
King, Sing-Yui, B.Sc., Ph.D., D.I.C., Hong Kong.
Marshall, John, B.A., A.C.I.S., Gobowen, Shropshire.
Meiring, Professor Adriaan Louw, B.A., B.Arch., F.R.I.B.A., Pretoria, South Africa.
Nabarro, Professor Frank Reginald Nunes, M.B.E., M.A., D.Sc., Johannesburg, Transvaal, South Africa.
Pearlson, Elias, L.D.S., Sunderland, Co. Durham.
Peterkin, Alexander Smith, Melbourne, Victoria, Australia.
Plaistow, Frederick Oliver Roy, Welwyn Garden City, Herts.
Saidai, M. Youssef, London.
Smeed, Charles William James, F.R.I.B.A., London.
Stedman, John Edward R., London.

Sterling, Joseph, London.
Summers, Leonard, London.
Tidswell, Norman Ernest, Liversedge, Yorks.
Tucker, Percy Gordon, Croydon, Surrey.
Watkin, Ronald Edward, Preston, Lancs.
Wilson, Henry, Preston, Lancs.
Winstanley, Frank, Weybridge, Surrey.

The following was elected an Associate Member:

Turnbull, Miss Sylvia Charmion, Wigton, Cumberland.

The following was admitted as an Institution in Union:

The Risley County Secondary School for Girls, London.

VACANCIES ON COUNCIL

It was announced that H.R.H. the President had nominated Sir George Edwards for election as a Vice-President of the Society, and that Sir Hilary Blood, Mr. R. E. Dangerfield, Sir Gilbert Rennie and Mr. C. A. P. Southwell had accepted nomination for election as Members of Council.

BICENTENARY MEDAL

The Bicentenary Medal for 1958 was awarded to Mr. John Gloag, Hon.A.R.I.B.A., Hon.F.S.I.A.

EXAMINATIONS

It was reported that the number of entries for the Summer series of Examinations was 148,886, as compared with 110,494 in 1957.

SECRETARY'S VISIT TO NORTH AMERICA

It was decided that the Secretary should visit the United States and Canada in the Autumn.

OTHER BUSINESS

A quantity of financial and other business was transacted.

CHRISTMAS CARD FOR 1958

The Society's Christmas Card this year will show a picture, specially painted by Miss Anna Zinkeisen, R.O.I., R.D.I., of the fifth Duke of Beaufort supervising the planting of acorns on his estate at Hawkesbury, Gloucestershire, in 1758. (For this work, which extended to twenty-three acres, the Duke received the Society's gold medal, the first of many subsequent awards for the encouragement of afforestation.)

A reproduction of Miss Zinkeisen's painting and an order form for the Christmas Card will be included in the *Journal* at a later date, but the more distant overseas Fellows may find it desirable for the sake of time to anticipate the form by placing an order in writing. If the name and address are required to be overprinted, the exact wording should be given.

FINANCIAL STATEMENTS FOR 1957

The following statements are published in accordance with Section 25 of the Society's Bye-laws

BALANCE SHEET, 31st December, 1957

1956 £		£	£
	General Fund Accounts—		
103,770	General Purposes Capital Account per annexed account (page 566)	91,155	
6,008	Dr. Cantor's Bequest	6,008	
2,548	Lord Bennett's Bequest	2,548	
7,468	Henry Morley's Bequest	7,468	
2,163	Dorothy Corfield's Bequest	2,163	
500	J. A. Milne's Bequest	500	
11,357	Life Composition Account (page 566): Unexpired balance of compositions received on the basis of taking credit for such compositions over a period of 12 years from their receipt	11,521	
133,814			121,363
	Specific Fund Accounts (page 566)—		
9,916	Amount accumulated towards pensions payable under Modified Superannuation Scheme	9,682	
1,072	Provision for Rehabilitation of Building, including £500 gift in memory of the late Lord Amulree ...	786	
168	Industrial Art Bursaries Fund Account	370	
—	**Fund for House Extension**...	1,282	
11,156			12,120
	Liabilities—		
6,743	Creditors	12,835	
5,075	Industrial Art Bursaries awarded (but not expended) ...	4,091	
18	*Preservation of Ancient Cottages Fund*	—	
	Uninvested Trust Capital:		
1	Cadman Memorial Fund	1	
443	Dr. Swiney's Bequest	1	
2,194	Unexpended Trust Income *less* Income over-expended (page 568)	2,310	
150	Contributions received for Industrial Art Bursaries to be awarded in 1958	31	
14,624			19,269
159,594	Carried forward		152,752

	£	£	*1956* £
General and Specific Fund Assets—			
Freehold Property, 6/8 John Adam Street			
Cost in 1922, plus additions, *less* sales and compensation received		49,788	*49,788*
Pictures, Books, Furniture and Fixtures (as fixed in 1919)		10,000	*10,000*
Investments:			
Freehold Ground Rents, at cost	1,229		*2,002*
Securities (page 567):			
General (Market Value £34,832—1956 £36,874)	45,684		*45,684*
Dr. Cantor's Bequest (Market Value £3,901—1956 £4,566)	5,941		*5,941*
Lord Bennett's Bequest (Market Value £1,672—1956 £1,958)	2,548		*2,548*
Henry Morley's Bequest (Market Value £5,003—1956 £5,740)	7,468		*7,468*
Dorothy Corfield's Bequest (Market Value £1,391—1956 £1,629)	2,119		*2,119*
J. A. Milne's Bequest (Market Value £392—1956 £460)	500		*500*
Held towards meeting pensions payable under Modified Superannuation Scheme (Market Value £6,781—1956 £6,911)	8,238		*8,238*
Fund for Rehabilitation of Building (Market Value £1,832—1956 £1,962)	2,500		*2,500*
		76,227	*77,000*
		136,015	*136,788*
Stocks of Stationery and Working Papers of Examinations Department at value estimated by the Society's printer	3,550		*3,420*
Debtors and Payments in Advance	5,454		*8,078*
Balances with Bankers and Cash in Hand	7,733		*11,308*
		16,737	*22,806*
Carried forward		152,752	*159,594*

BALANCE SHEET, 31st December, 1957—*continued.*

1956		£	£	£
159,594	Brought forward			152,752
	Trust Fund Accounts—			
30,339	Capital Account : Balance at 31st December, 1956		31,562	
	Add : Final Receipts in respect of the			
78	*Thomas Gray Memorial Trust*		—	
1,000	*Fred Henry Andrews' Bequest*		—	
145	*Profit on Sale of Freehold Ground Rents*		—	
	Balance of Fund for Preservation of Ancient Cottages—representing James			
—	Cranstoun Bequest	2,188		
—	*Less*—unexpended income	647		
			1,541	
31,562			33,103	
2,415	Unexpended Income (net)		3,143	
33,977				36,246

Notes :

(1) Credit has been taken for the whole of the subscriptions received during the year, although some relate to periods expiring after the date of the Balance Sheet, but no credit has been taken for subscriptions due but unpaid at 31st December, 1957.

(2) The balances standing to the credit of the various Fund Accounts are subject to the market value of the relative investments, the majority of which are dated stocks.

£193,571				£188,998

1956		£	£	£
Brought forward			152,752	*159,594*
Trust Fund Assets—				
Capital : Investments (page 568) :				
Freehold Ground Rents, at cost		1,418		*1,418*
Securities (Market Value £22,247—1956 £24,055)		30,683		*29,700*
Cottages at Drayton St. Leonards ...		1,000		—
		33,101		*31,118*
Uninvested Funds...		2		*444*
		33,103		*31,562*
	£			
Income : Investments (page 568) :	833			*221*
(Market Value £696—1956 £214)				
Due from the Society	2,310			*2,194*
		3,143		*2,415*
			36,246	*33,977*

On behalf of the Council

ALFRED C. BOSSOM *Chairman.*
PETER A. LE NEVE FOSTER } *Treasurers.*
F. A. MERCER }

Report of the Auditors to the Council and Fellows of the Royal Society of Arts.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Society so far as appears from our examination of those books. We have examined the above Balance Sheet and annexed Income and Expenditure Account which are in agreement with the books of account. In our opinion and to the best of our information and according to the explanations given us the Balance Sheet gives a true and fair view of the state of the Society's affairs as at 31st December, 1957, and the Income and Expenditure Account gives a true and fair view of the income and expenditure for the year ended on that date.

5 London Wall Buildings,
London, E.C.2.
10th June, 1958.

DELOITTE, PLENDER, GRIFFITHS & CO., *Chartered Accountants.*

INCOME AND EXPENDITURE ACCOUNT

for the Year ended 31st December, 1957

EXPENDITURE

1956		£	£
	Printing and Publishing *Journal*—		
7,345	Printing and Paper	7,027	
1,440	Postages...	1,530	
971	Salaries, Reviews, Shorthand Reports and other expenses	986	
9,756			9,543
1,429	Library—Salaries, Books, etc.		1,452
112	Cost of Albert and Society's Medals and R.D.I. Expenses		304
	Industrial Art Bursaries—		
200	Contribution to Fund	200	
1,237	Expenses of Competition, including Salaries ...	1,188	
1,437			1,388
195	Cantor and Morley Lectures		115
	Examination Expenses—		
14,362	Examiners' Fees	15,759	
9,607	Stationery and Printing	11,038	
6,263	Other Expenses	11,451	
17,859	Proportion of Salaries as below	20,199	
422	Proportion of House and Office Expenses as below	482	
48,513			58,929
61,442	Carried forward		71,731

INCOME

1956		£	£
17,369	Annual Subscriptions received during year		19,795
712	Registration Fees		764
2,003	One-twelfth of Life Compositions received during twelve years to date		2,077
	Income from—		
116	Ground Rents	57	
1,664	General Fund Investments	1,711	
212	Dr. Cantor's Bequest	212	
91	Lord Bennett's Bequest	91	
266	Henry Morley's Bequest	266	
76	Dorothy Corfield's Bequest	76	
21	J. A. Milne's Bequest	21	
261	Trust Funds for General Purposes	257	
70	Bank and Deposit Accounts...	136	
2,777			2,827
900	Sales of *Journal*, etc.	670	
1,545	Advertisements in *Journal*	1,113	
2,445			1,783
49,194	Examination Fees	56,729	
3,051	Sales of Examination Papers and Advertisements ...	3,682	
52,245			60,411
411	Rents Receivable		5,514
77,962	Carried forward		93,171

1956		£	£
£			
61,442	Brought forward		71,731
26,982	Salaries, Wages and Superannuation Scheme	30,328	
	Less : Proportion estimated to be applicable to		
17,859	Examinations above	20,199	
9,123			10,129
—	Rent Payable		7,525
	House and Office Expenses—		
984	Rates and Insurance	1,035	
185	Repairs, Renewals and Decorations	41	
1,024	Lighting, Heating, Cleaning, Expenses of Meetings and General Charges	1,294	
2,025	Stationery, Printing, Postages, Telephone, Audit and Accountancy and other Office Expenses ...	2,445	
4,218		4,815	
422	*Less :* Proportion (10 per cent.) allocated to Examinations above	482	
3,796			4,333
1,240	Pensions	1,185	
556	*Less :* Charged against Modified Superannuation Scheme Fund Account	528	
684			657
2,917	*Excess of Income over Expenditure carried to General Purposes Capital Account*		—
£77,962			£94,375

1956		£	£
£			
93,171	Brought forward		77,962
1,204	Excess of Expenditure over Income carried to General Purposes Capital Account		—
£94,375			£77,962

GENERAL PURPOSES CAPITAL ACCOUNT

for the Year ended 31st December, 1957

1956					1956
£		£		£	£
—	Initial disbursement *re* 2/4 John Adam Street and 18 Adam Street	10,000	Balance at 31st December, 1956 ...	103,770	99,507
—	Legal charges and Installation charges *re* 2/4 John Adam Street and 18 Adam Street	1,687	*Contributions from American Philosophical Society*	—	357
—	Excess of Expenditure over Income *per* foregoing Account	1,204	*Repairs recovered from the War Damage Commission*	—	257
103,770	Balance per Balance Sheet	91,155	Proceeds of Sale of Books from Library	6	214
	Note : There is a commitment at 31st December, 1957, in respect of alterations to buildings amounting to approximately £7,000.		Profit on Sale of Freehold Ground Rents	268	504
			Sales of "History of the R.S.A." ...	2	14
			Excess of Income over Expenditure per foregoing account	—	2,917
£103,770		£104,046		£104,046	£103,770

LIFE COMPOSITION ACCOUNT for the Year ended 31st December, 1957

1956					1956
£		£		£	£
	Amount taken into the Society's Income—		Balance at 31st December, 1956 ...	11,357	11,771
2,003	One-twelfth of Compositions received during twelve years to date	2,076	Compositions received during year ...	2,240	1,589
11,357	Balance per Balance Sheet	11,521			
£13,360		£13,597		£13,597	£13,360

SPECIFIC FUND ACCOUNTS for the Year ended 31st December, 1957

1956					1956
	Amount accumulated towards pensions payable under Modified Superannuation Scheme—		**Industrial Art Bursaries Fund Account—**		
£		£		£	£
10,178	Balance at 31st December, 1956 ...	9,916	Balance at 31st December, 1956 ...	168	201
294	*Add :* Interest on Investments ...	294	*Add :* Contributions received ...	3,050	2,835
10,472		10,210		3,218	3,036
556	*Deduct :* Proportion of Pensions paid during year ...	528	*Deduct :* Bursaries awarded for 1957 ... ... £3,050		3,050
£9,916		£9,682	Cost of pamphlets and other Expenses 1,186		1,255
				4,236	4,305
	Provision for Rehabilitation of Building—		*Less :* charged against Income and Expenditure Account 1,388		1,437
£		£		2,848	2,868
1,524	Balance at 31st December, 1956 ...	1,072		£370	£168
75	*Add :* Interest on Investment ...	75	**Fund for House Extension—**	£	£
1,599		1,147	Contributions received in 1957 ...	1,259	—
527	*Deduct :* Repairs and Renewals charged against Fund	361	Deposit Interest	23	—
£1,072		£786	Balance at 31st December, 1957 ...	£1,282	—

INVESTMENTS

31st December, 1957

		Cost £
Society		
£5,000	British Transport 3 per cent. Stock 1978/88	4,820
£10,000	3½ per cent. Conversion Stock 1969	10,189
£24,370	British Electricity 4½ per cent. Stock 1974/79	25,871
£7,000	2½ per cent. Consolidated Stock	4,804
		£45,684
Dr. Cantor's Bequest		Cost
£6,048	3½ per cent. Funding Stock 1999/2004	£5,941
Lord Bennett's Bequest		Cost
£2,593	3½ per cent. Funding Stock 1999/2004	£2,548
Henry Morley's Bequest		Cost
£7,603	3½ per cent. Funding Stock 1999/2004	£7,468
Dorothy Corfield's Bequest		Cost
£2,157	3½ per cent. Funding Stock 1999/2004	£2,119
J. A. Milne's Bequest		Cost
£609	3½ per cent. Funding Stock 1999/2004	£500
Modified Superannuation Scheme		Cost
£4,709	4 per cent. Funding Stock 1960/90	£4,709
£1,536	3 per cent. Funding Stock 1959/69	1,529
£2,000	3 per cent. Savings Bonds 1960/70	2,000
		£8,238
Fund for Rehabilitation of Building		Cost
£2,500	3 per cent. Savings Bonds 1960/70	£2,500
Trust Funds		Cost or value when received in trust
	Dr. Aldred Trust.	
£142	3½ per cent. Funding Stock 1999/2004	£140
	Art Congress Studentship.	
£1,495	3½ per cent. Funding Stock 1999/2004	1,469
	R. B. Bennett Empire Prize Trust.	
£1,463	3½ per cent. Funding Stock 1999/2004	1,437
	Sir George Birdwood Memorial Fund.	
£678	3½ per cent. Funding Stock 1999/2004	666
	Selwyn Brinton Trust.	
£1,013	3½ per cent. Funding Stock 1999/2004	995
	Alfred Davies Bequest.	
£1,988	3½ per cent. Funding Stock 1999/2004	1,953
	Le Neve Foster Trust.	
£372	3½ per cent. Funding Stock 1999/2004	366
	John Fothergill Trust.	
£251	3½ per cent. Funding Stock 1999/2004	247
	Thomas Gray Memorial Trust.	
	Capital Account :	
£9,048	3½ per cent. Conversion Stock 1961 or after	£7,000
£1,174	3½ per cent. War Stock 1952 or after	995
£212	British Transport 3 per cent. 1978/88	179
£760	3½ per cent. Funding Stock 1999/2004	730
	Income Account : £475 3½ per cent. Funding Stock 1999/2004	383
		9,287
	Howard Trust.	
£472	3½ per cent. Funding Stock 1999/2004	463
	Owen Jones Memorial Trust.	
£480	3½ per cent. Funding Stock 1999/2004	472
	Neil Matheson McWharrie Trust.	
£338	3½ per cent. Funding Stock 1999/2004	332
	Dr. Mann Trust.	
£949	3½ per cent. Funding Stock 1999/2004	932
	Mulready Trust.	
£102	3½ per cent. Funding Stock 1999/2004	100
	North London Exhibition Trust.	
£135	3½ per cent. War Stock 1952 or after	185
	Sir William J. Pope Memorial Fund.	
£345	3½ per cent. Funding Stock 1999/2004	339
	Russian Embassy Prize.	
£92	3½ per cent. Funding Stock 1999/2004	91
	Benjamin Shaw Trust.	
£86	3½ per cent. Funding Stock 1999/2004	85
	John Stock Trust	
£64	3½ per cent. Funding Stock 1999/2004	63
	Dr. Swiney's Bequest.	
	Freehold Ground Rents	£1,418
£5,391	3½ per cent. Funding Stock 1999/2004	5,082
		6,500

INVESTMENTS—*continued*

Trueman Wood Lecture Endowment Fund.		
£860 3½ per cent. Funding Stock 1999/2004		£844
Cadman Memorial Fund.		
£358 3½ per cent. Funding Stock 1999/2004		351
Thomas Holland Trust.		
£414 3½ per cent. Funding Stock, 1999/2004		406
E. Frankland Armstrong Trust.		
£527 3½ per cent. Funding Stock 1999/2004		518
Joseph Paxton Memorial Trust.		
£1,147 3½ per cent. Funding Stock 1999/2004		1,127
A. C. Bossom Lecture Endowment Fund.		
£585 3½ per cent. Funding Stock 1999/2004		575
Fred Cook Memorial Lecture Fund.		
£1,008 3½ per cent. Funding Stock 1999/2004		1,000
Fred Henry Andrews' Bequest.		
£1,252 3½ per cent. Funding Stock 1999/2004		1,000
James Cranstoun Bequest		
Capital Account : £556 Agric. Mortgage Corpn. 4½ per cent. Deb. Stock 1961/91	£541	
£1,000 Cottages—Drayton St. Leonard	1,000	
Income Account : £605 3½ per cent. Funding Stock 1999/2004	450	
		1,991
		£33,934
Representing : Capital Account		33,101
Income Account		833
		£33,934

TRUST INCOME AND EXPENDITURE

for the year ended 31st December, 1957

	Unexpended Income 1st Jan. 1957.	Income received during year.	Expenditure on lectures, prizes and administration.	Amount applied to Society's General Purposes.	Unexpended Income carried forward 31st Dec. 1957.
	£	£	£	£	£
Dr. Aldred Trust	25	5	—	—	30
Art Congress Studentship	255	52	5	—	302
R. B. Bennett Empire Prize Trust	127	51	107	—	71
Sir George Birdwood Memorial Fund	171	24	32	—	163
Selwyn Brinton Trust	326	35	2	—	359
Alfred Davies Bequest	—	70	—	70	—
Le Neve Foster Trust	7	13	21	—	*Dr.* 1
John Fothergill Trust	53	9	21	—	41
Thomas Gray Memorial Trust	478	404	388	—	494
Howard Trust	99	17	51	—	65
Owen Jones Memorial Trust	134	17	1	—	150
Neil Matheson McWharrie Trust	8	12	1	—	19
Dr. Mann Trust	*Dr.* 26	33	46	—	*Dr.* 39
Mulready Trust	14	3	—	3	14
North London Exhibition Trust	101	4	—	—	105
Sir William J. Pope Memorial Fund	38	12	1	—	49
Russian Embassy Prize	51	3	—	—	54
Benjamin Shaw Trust	*Dr.* 2	3	—	—	1
John Stock Trust	55	2	1	—	56
Dr. Swiney's Bequest	120	224	—	184	160
Trueman Wood Lecture Endowment Fund	4	30	33	—	1
Cadman Memorial Fund	47	13	16	—	44
Thomas Holland Trust	28	14	16	—	26
E. Frankland Armstrong Trust	39	18	1	—	56
Joseph Paxton Memorial Trust	187	40	2	—	225
A. C. Bossom Lecture Endowment Fund	13	20	—	—	33
Fred Cook Memorial Lecture Fund	42	35	26	—	51
Fred Henry Andrews' Bequest	21	44	1	—	64
James Cranstoun Bequest	647	61	158	—	550
	3,090	£1,268	£930	£257	3,183
	Dr. 28				*Dr.* 40
	£3,062				£3,143
Represented by : Amount due by Society					2,310
Balance invested as above					833
					£3,143

THE GEOLOGICAL SURVEY OF GREAT BRITAIN

Two Cantor Lectures by

SIR WILLIAM PUGH, O.B.E., D.Sc., F.R.S.,

Director, Geological Survey of Great Britain and Museum of Practical Geology

LECTURE I

Monday, 10th March, 1958

Geology is the science which deals with the structure and history of the earth; it may be divided into four main branches of study. Mineralogy and petrology are concerned with the materials of which the earth is made; mineralogy with the physical and chemical characters of the inorganic substances found on and in the earth's crust; petrology with the character and origin of the rocks which are made of one or more minerals. Physical geology deals with the physical processes operating on the earth, such as the atmosphere, water, ice and the sea, as well as the movements of molten rock-material within and on the earth's crust together with movements of the crust itself; these are the processes which produce the earth's surface features. Palaeontology and palaeobotany investigate the remains of animals and plants preserved in the rocks as fossils and the evolution of life through geological time. Stratigraphy or historical geology determines the order of age of the rocks, the conditions under which they were formed, and the sequence of physical and geographical conditions which prevailed in the successive stages of the history of the earth.

The close of the eighteenth and the beginning of the nineteenth centuries was a historic period in the development of geological science. James Hutton discussed the formation of rocks and showed that the phenomena exhibited by them might be explained by physical causes which were the same as those operating at the present time. His book, *The Theory of the Earth*, was published in 1795; he may be regarded as the founder of modern geology. William Smith discovered that different fossil faunas distinguish stratified rocks of different ages. He was responsible for the study of the age and arrangement of the stratified or sedimentary rocks, thereby laying the foundations of stratigraphy. His geological map of southern Britain, published in 1815, was an immense step forward. Charles Lyell published the first volume of his book, *The Principles of Geology*, in 1830 and set geology upon its present course as a systematic science. These are only three of the pioneers, but by this time the principles of geology had been established and expounded; there was a new approach to the study of geology and it was possible to make geological maps as we now understand them.

A geological map shows the nature and distribution of the rocks found at the

surface of the earth, their ages and the relations between them. It is the most important way of recording geological information and of making known geological discoveries; it is also the basis for nearly all the practical applications of geology. It was not possible to make geological maps of this type until William Smith had established the principles of the stratigraphical classification of rocks, and he was the first to make such maps on truly scientific lines. He made one of the country around Bath as early as 1799, but his masterpiece was his coloured map on the scale of five miles to the inch of England, Wales and part of Scotland, published in 1815. The Geological Society of London was founded in 1807, and a year later its first President, G. B. Greenough, began the preparation of a map of England and Wales on the scale of six miles to the inch; it was first published in 1820. John Macculloch began to make a map of Scotland in 1811, and this, on the scale of four miles to the inch, was published in 1836. Richard Griffith commenced work a little earlier in Ireland, and his map on the same scale was published in 1839. In addition to these general maps, others of local areas appeared in books and in journals. The preparation of geological maps was making progress, but one of the difficulties at this time was to obtain suitable topographical maps on which to record geological observations. Geological mapping in detail depends upon the scale and accuracy of the topographical map; these early workers had to record their observations on maps of small scale and indifferent quality.

The Ordnance Survey, which is responsible for the preparation of topographical maps, came formally into existence in 1791. Topographical surveying was almost entirely confined to the scale of one inch to the mile until 1824, by which time most of southern England and Wales had been covered. Then the six-inch survey of Ireland was commenced, but similar work in Great Britain did not begin until 1840, namely in the north of England and the south of Scotland; it was not until 1870 that one-inch sheets were available for the whole of Great Britain. Surveying on the scale of twenty-five inches to the mile began in 1854.

In 1826 the Ordnance Survey came under the control of Captain Colby, who was anxious that his maps should be used for other surveys; in 1832 Henry De la Beche was authorized to place colours illustrative of the geology upon the one-inch sheets of south-west England. Three years later the Ordnance Survey sought the advice of the President of the Geological Society of London and the Professors of Geology at Oxford and Cambridge upon the best way of combining the topographical and geological mapping. De la Beche was chosen to direct and organize the geological work, and in 1835 was founded the Geological Survey of Great Britain. The Geological Survey may be regarded as the child of the Ordnance Survey and the Geological Society of London; in a wider setting it grew out of the quickening of geological thought and the development of topographical mapping at the beginning of the nineteenth century.

For four years, De la Beche was the only officer of the Geological Survey, but he completed his mapping of south-west England, and in 1839 he published the first report of the Survey; it set a pattern for subsequent memoirs descriptive

of particular areas, and as to-day, close attention was given to economic geology. He did many other things; he founded the Museum of Practical Geology for the display of rocks and minerals of value to industry; within the Museum he set up the first School of Mines in this country, now the Royal School of Mines and part of the Imperial College of Science and Technology; and he established a Mining Records Office which was later transferred to the Home Office. He was remarkably successful in the choice and training of staff; an epoch in geological mapping began under his direction. Furthermore, members of his staff carried the knowledge and experience to many parts of the British Commonwealth, India, Canada, Australia, where Geological Surveys were established on the model of that in Great Britain.

The Geological Survey and Museum have experienced many changes of control, but since 1919 they have been part of the Department of Scientific and Industrial Research. The present-day functions may be summarized as follows:

(1) The preparation and publication of geological maps and memoirs of Great Britain and Northern Ireland.

(2) The investigation of the geology of coal, iron ore, non-ferrous ores, and minerals and rocks used for industrial purposes.

(3) The investigation of problems of water supply, particularly of underground water.

(4) The discovery and evaluation of raw materials, at home and overseas, for atomic energy.

(5) The maintenance and development of the Museum of Practical Geology as a centre of instruction and research.

(6) The provision of geological information and advice to Government departments, national boards, industrial concerns, and the general public.

The scientific staff which carries out these functions is divided into two main groups, field and special. The field staff is concerned primarily with geological mapping. The special staff is concerned mainly with special branches of geology, namely, palaeontology, petrology, geophysics, water and atomic energy; and in addition there is the Museum of Practical Geology.

The Geological Survey was founded to prepare copies of the Ordnance Survey maps geologically coloured in order to provide an accurate representation of the geology of this country which would be of service to science and to industry. These maps and memoirs set out the details of British geology; they are fundamental not only for understanding the geology of this country but also for investigations into our natural resources.

When the Geological Survey was founded, the only topographical maps available were on the scale of one inch to the mile, and geological mapping therefore began upon them; the whole of Wales and practically the whole of southern and central England was so mapped. Geological mapping on the scale of six inches to the mile began in England about 1860 and was gradually extended over most of northern England. The one-inch maps which were produced at this time are now called the Old Series and they were available for practically the whole of England and Wales by about 1884. When the New Series Ordnance

Survey maps appeared for England and Wales they were adopted for the one-inch geological maps, and the New Series geological sheets, in all cases based upon six-inch mapping, began to appear in 1893. They are usually published in two editions, Drift and Solid: the former shows the superficial deposits, for example, sands and clays, and the solid rocks where they appear at the surface; the latter shows the solid rocks as they would appear if the cover of superficial deposits were removed.

The mapping of Scotland was carried out partly on the one-inch but mainly on the six-inch scale; it was commenced in the Lothians in 1854 and extended across the Highland border-line in 1877 and into the north-west Highlands in 1882. A considerable area in Inverness-shire and the whole of the Outer Hebrides have yet to be systematically mapped by the Geological Survey.

The Survey began mapping in Ireland in 1845, and since six-inch topographical maps were available, the work was undertaken from the outset on that scale. The one-inch maps of Ireland began to appear in 1855 and the survey was completed in 1887, but many of the sheets were not published until after that date. The Geological Survey ceased to have responsibility for work in Ireland many years ago, but since the war the Survey has established an office in Belfast at the request of the Government of Northern Ireland.

The Geological Survey now carries out its mapping in all areas on the six-inch scale unless a still larger one is required for some particular purpose; to-day six-inch geological maps are essential for both scientific and industrial purposes. The programme falls into two categories: primary mapping where ground is being covered for the first time on the six-inch scale, and revision mapping where pre-existing six-inch geological maps are being brought up to date in the light of new information and new knowledge. There are still large areas, particularly in England and Wales, which have yet to be mapped on the six-inch scale, although a great deal of work has been done in them by academic and other geologists. There are many reasons for these arrears of primary mapping; apart from the magnitude of the task, there has been the necessity of concentrating the mapping, accompanied by constant revision in the areas of economic importance, particularly, for example, the coalfields. Revision mapping is necessary in all areas and especially in those of economic importance so that new information derived from quarrying, mining, boring and so forth may be collected, leading to a fuller understanding of the geological conditions. Geological mapping is not static; new techniques and new knowledge demand constant reconsideration of all areas, upon whatever scale they may have been mapped.

It is convenient to mention here the maps which are published by the Geological Survey. There are the six-inch maps of areas of economic importance, particularly the coalfields, and in addition of the London district; but all completed six-inch maps, whether or not published, are available for public reference in the offices of the Survey. Then there are the one-inch maps, and these are in turn reduced to those on the scales of four, ten, and twenty-five miles to the inch, all colour-printed, and giving a progressively generalized

picture of the geology of Great Britain. The memoirs are usually explanatory of the one-inch sheets, but there are many special memoirs in varied fields of geological science. These maps and memoirs which have been published for over a hundred years provide fundamental information upon most aspects of British geology, including the economic geology of this country.

Geological mapping is a technical matter which can only be satisfactorily demonstrated in the field. Briefly, the geologist records on the six-inch topographical map every exposure of rock, its nature and any fossils found in it, its arrangement and everything which he can then and there find out about it; and he does the same for the superficial deposits, for example, of sand or clay, which so often in this country conceal the solid rocks. He collects the records of wells, shafts and borings; and if in a mining area, information from mining plans as well as going underground to make his own observations. He records all this information and he draws on the map the boundaries between one kind of rock and another. It is essentially observational work, but it calls for experience and wide geological knowledge.

The study of aerial photographs may be of considerable assistance. They give topographical information in addition to that shown on the map, and they also frequently show details of the geology as well as affording a general view of the nature of the ground; the fixation of position and the drawing of geological boundaries may be facilitated by the use of them. They will doubtless be used still more extensively as and when geological mapping is carried out on larger scale maps.

It is possible that certain physical aids may be used in the future, such as, for example, the Geiger-Müller counter and the scintillometer which are so widely employed in the search for radioactive minerals. The Geological Survey has done a great deal of work in the design of such counters for use in the field, including the installation of them in motor cars for quick reconnaissance in countries overseas. These counters have possibilities in determining the boundaries between rocks and of detecting variations in outcrops of what appear to be homogeneous rocks.

The work of the field geologists is supplemented by those working in the special departments, particularly in petrology and palaeontology. The Petrographical Department applies the appropriate laboratory techniques in the examination and identification of the rocks and minerals which have been collected in the field, especially the study of them in thin section under the microscope; and this is supported by work in the Chemical Department. The Palaeontological Department examines and identifies the fossils which are so important as markers for determining different levels in the succession of the stratified rocks. The petrologist and the palaeontologist play essential parts in the accurate portrayal of the geology on the maps and in its detailed description in the memoirs explanatory of the maps.

A geological map shows the distribution and arrangement of the rocks at the surface of the ground. It is a two-dimensional picture of phenomena which possess three dimensions. The third dimension of underground distribution and arrangement is also of scientific and economic importance. The underground

distribution and arrangement can be inferred from the map and illustrated by horizontal sections; in general, the more detailed and accurate the map, the more nearly will the horizontal section show the true underground arrangement of the rocks, but many difficulties may be encountered in drawing these sections. The geologist also constructs vertical sections which show the succession of the rocks below the surface at a given place; these sections are useful for illustrating variations in the characters of the rocks from place to place.

The inferences shown in horizontal and vertical sections are supplemented wherever possible by information obtained from mines and boreholes. It is a statutory obligation under various Acts of Parliament to notify the Geological Survey of all borings and sinkings to a depth of over 100 feet for minerals and to over 50 feet for water and to give access to them for the purpose of examination. A large amount of underground information is thus collected each year. The amount of exploratory boring in Great Britain since the war has been without precedent; the total footage of rocks examined, for example, in 1957 under these Acts was considerably in excess of 200,000 feet. In addition, the examination of rocks in mines and tunnels totalled nearly 200,000 feet.

There are, however, many variables in the succession of the rocks and in their structural arrangement which set limitations upon inferences concerning their underground distribution and arrangement in the absence of information from mines and boreholes; this is particularly the case where a younger group of rocks rests discordantly upon an older group with a different geological structure; and the inferences become more difficult with increasing depth. These are the reasons for the use of geophysical investigations and for undertaking a special programme of boring.

Since the war, the Geological Survey has undertaken a programme of boring to investigate the underground structure of areas where there is a lack of direct information and where it is difficult or impossible to make reasonable inferences from the map. The programme is designed primarily to extend the scientific findings of the Survey. Some of the Geological Survey boreholes are related to geological mapping; others are planned to investigate the results of geophysical investigations.

A year or two ago, the Survey carried out a number of relatively shallow boreholes to a depth of 300 to 900 feet to assist in the construction of the geological map of the Stockport area. The six-inch mapping of this area had been revised, but over much of it the solid rocks are concealed beneath superficial deposits, mainly sands and clays of glacial origin. A series of carefully sited boreholes penetrated these superficial deposits and descended for some distance into the underlying solid rocks to ascertain their nature and their position in the stratigraphical succession. The information so obtained also enabled the displacement of certain faults to be determined and for the solid geology to be more accurately shown on the map. This is an example of a programme of shallow borings directly related to six-inch geological mapping, incidentally the first undertaken by the Survey.

The Survey recently completed the six-inch revision mapping of the

Chesterfield area, which is occupied by Carboniferous Limestone with lead-zinc-fluorspar mineralization followed by Millstone Grit and Coal Measures; these Carboniferous rocks are overlain discordantly by Permo-Triassic rocks incidentally a source of dolomite and moulding sand. Four boreholes were drilled in the Ashover district, near Matlock, to depths varying between 580 and 1,140 feet to determine the detailed succession and structure of the Millstone Grit and the upper part of the Carboniferous Limestone. The investigation was not primarily a search for mineral deposits but was planned as a preliminary to further exploration of an area of potential economic importance.

The Survey has also undertaken deep boreholes related to geological mapping. The primary six-inch mapping of the Bristol-Somerset Coalfield was recently completed. It so happens that the strata between the Carboniferous Limestone and the Coal Measures are almost everywhere concealed beneath younger Triassic rocks with a quite different structural arrangement; and they are not adequately seen in mine workings or boreholes. A borehole was drilled in the southern outskirts of Bristol to a depth of 2,195 feet. It began in Triassic and then, as expected, passed into the lower part of the Coal Measures; at greater depth it entered the previously unknown rocks and eventually penetrated well-known levels in the Carboniferous Limestone. The unknown rocks were found to be several hundred feet thick, and their characters were fully revealed; they are roughly equivalent to the Millstone Grit of northern England. The information obtained was of value in completing our knowledge of the Carboniferous rocks of the region, and of potential economic importance since if they are now encountered, it will be possible to forecast the position of the coal-bearing strata.

Similar deep boreholes have been drilled elsewhere, but an example will be given of one drilled for rather different reasons. In 1875 a borehole at Burford in Oxfordshire was said to have entered Coal Measures beneath the younger Mesozoic rocks found at the surface, but the records were inconclusive. Later a borehole at Batsford, some sixteen miles north of Burford, proved 542 feet of non-productive upper Coal Measures again beneath Mesozoic rocks. It was decided to drill a deep borehole near Burford to prove the older rocks at depth and to determine their thickness and economic importance. This borehole passed through the Mesozoic and entered Coal Measures at a depth of 1,105 feet. It proved a thickness of 2,664 feet of Coal Measures with only occasional thin coal seams. Unfortunately, drilling had then to be stopped because of technical difficulties, leaving unanswered the question whether or not these upper Coal Measures are underlain by productive measures with coal seams of economic thickness. There seems little doubt that considerable areas in this part of England are underlain by Coal Measures, but we do not know whether productive measures are present and, if present, whether they are in places within reasonable depth for mining.

Geophysical surveys are an important way of investigating indirectly underground geological structures; there are four main methods, gravitational, magnetic, electrical and seismic. The gravitational method depends upon the

fact that excess mass distributions below the earth's surface cause an additional downward attraction which will be revealed as an increase of gravity at the surface; briefly the method uses the differences in density of underground masses, which are heavier or lighter than the adjacent rock. The magnetic method permits the determination of differences in the magnetic susceptibility of the earth, and these differences are recorded as variations of the components of the earth's magnetic field. Gravitational and magnetic methods depend upon naturally occurring fields, whereas electrical and seismic methods depend upon artificially imposed fields. The varying electrical conductivity of the earth is the basis of the electrical method; the seismic method deals with the recording and interpretation of elastic waves artificially generated and impressed upon the sub-surface layers of rock.

The Geological Survey has undertaken systematic regional geophysical surveys since the war, particularly by gravimeter and magnetometer. The Survey is collecting and collating the gravity data for the whole of Great Britain in order to prepare gravity maps. These maps are being published as transparent overlays, which can be superposed upon the appropriate geological maps in order to obtain a better understanding of underground geological structures.

The Survey has undertaken a good deal of work on the ground by magnetometer, and in 1955 began a systematic survey with the magnetometer carried by an aeroplane over an area of about 11,000 square miles in the English Midlands. This area was selected because of its varied relief and geology; and also because it had been covered by gravity and in part by ground magnetic survey. The main objectives were to compare the results of airborne magnetometer, ground magnetometer and gravimeter surveys in relation to known geological structures; and also, by flying different parts of the area by different methods of flight control, to assess the method most suited to the topographical and geological conditions. The southern part of the area was flown at constant barometric height of 1,800 feet above sea-level; the northern part, which includes the Southern Pennines, was flown by the 'contour' method of constant separation from the ground of 1,000 feet. This work was continued in 1956 and 1957; over 40,000 square miles in central, eastern and southern England with adjacent coastal waters have now been covered by airborne magnetic survey, and the results are being studied in detail.

Last year, a combined magnetic, electromagnetic, and radiometric airborne survey of south-west Cornwall was undertaken for the Geological Survey and the United Kingdom Atomic Energy Authority to assess the merits of all three methods both singly and in combination; this survey was flown at constant separation from the ground of 500 feet. Electromagnetic surveys from the air have attracted much attention, particularly in North America, in connection with the investigation of mineral deposits; radiometric surveys by airborne scintillometer are widely used to investigate possible occurrences of radioactive minerals. Cornwall was selected for the trial as providing a suitable proving ground for the techniques and at the same time as an area in which hidden mineral lodes might be discovered. The results are not fully to hand, but the

anomalies revealed by the radiometric survey are being investigated by portable scintillometers, by pitting and trenching, and in some instances by the examination of abandoned mines.

As yet the Geological Survey has undertaken comparatively little work by seismic methods, but other investigators have carried out such surveys particularly in the search for underground structures which might contain oil and natural gas.

The results of geophysical surveys are often difficult to interpret, and the inferences made from them usually need to be proved by the drilling of boreholes; but such surveys are particularly valuable in suggesting sites for exploratory boreholes, especially where underground geological structures cannot be inferred from the rocks seen at the surface.

A gravity survey carried out by the D'Arcy Exploration Co. Ltd. across south central England was published in 1951. This showed a pronounced gravity 'low' in several places; that over the estuary of the Thames seemed to warrant investigation by a borehole since it might possibly represent a basin of coal-bearing strata, although such evidence as was available by extrapolation from boreholes in the nearest areas was not wholly favourable. The Geological Survey undertook in 1955 a borehole in Canvey Island on the north side of the Thames Estuary. The thickness of the Mesozoic rocks could be estimated within reasonable limits before drilling, but it was impossible to forecast the nature of the underlying older rocks. The borehole passed through the Mesozoic at about 1,300 feet below the surface and then entered Palaeozoic rocks; however, these rocks were older than the Coal Measures.

The gravity survey revealed another gravity 'low' south of London in the Croydon district; here again the gravity anomaly might possibly represent a basin of coal-bearing strata. The borehole commenced in Chalk and then passed into the underlying Cretaceous rocks, the thickness of which could be estimated with fair accuracy from the outcrops of these rocks at the surface; but what lay beneath the Cretaceous was impossible to forecast without having recourse to the drill. It was possible that the Cretaceous rocks were underlain by older Palaeozoic rocks, or that the Cretaceous rocks rested upon a relatively small thickness of Jurassic rocks which in turn were superposed upon older rocks, or that the Cretaceous rocks were underlain by a full development of Jurassic rocks and that these rested upon older Palaeozoic rocks. The borehole revealed that the Cretaceous is underlain by a full development of Jurassic rocks; the base of the Jurassic was passed at about 4,500 feet below the surface, but the underlying older Palaeozoic rocks proved to be of pre-Coal Measures age. A little natural gas and a show of oil were encountered in the Jurassic rocks at a depth of about 3,000 feet, but they were not present in sufficient quantities to be of economic importance. This borehole failed to prove Coal Measures even at depth, but it has given results of great scientific interest which will add considerably to our knowledge of the Mesozoic rocks of south-east England.

A geophysical survey using seismic methods was carried out by Sir Edward Bullard and others in the Cambridge district and the results were published in 1940. A contour map of the older rock surface beneath the cover of younger

Mesozoic rocks was made; the depth to this ancient rock floor, for example, at Cambridge was estimated to be about 430 feet below the surface of the ground. Professor W. B. R. King initiated a scheme to investigate the depth to and the nature of the floor by means of a borehole. Eventually the Geological Survey undertook the boring; the floor was entered at almost exactly the depth inferred from the seismic survey. It was found to consist of Carboniferous Limestone, that is of greater age than the Coal Measures; the presence of Carboniferous Limestone was quite unexpected. Later the Survey drilled two other boreholes in the Cambridge district; the estimated depth to the old rock floor was a good deal different from that proved by drilling, and in each of them the floor consisted of rocks which are older than the Carboniferous Limestone.

Interesting and valuable geophysical work can be carried out in boreholes by lowering equipment into them and recording on meters various kinds of physical information, for example, gamma-radiation, electrical and temperature variations as well as variations in the diameter of the borehole. The rate of penetration of the drill may also be measured. The records are called geophysical logs, and they give complementary information. Gamma-radiation and electrical logs are related to the nature of the rocks at different levels below the surface in the borehole. These geophysical logs are particularly useful where solid cores are not taken in boreholes; they give much information about the succession of the rock.

The Palaeozoic and Pre-Cambrian rocks occupy the south-west of England, Wales, and much of the north of England; they also occupy comparatively small areas in the English Midlands. The Mesozoic and Tertiary rocks cover large areas in central, eastern and southern England; these younger rocks rest discordantly and at widely varying depths upon a platform made of the older Palaeozoic and Pre-Cambrian as seen, for example, in several of the boreholes which have been described. However, as yet comparatively little is known about the nature, distribution and structure of these ancient rocks, and it is impossible to make forecasts about them because the younger Mesozoic and Tertiary rocks seen at the surface are wholly unrelated and have a different structural arrangement. It is part of the Geological Survey programme of boring, supplemented by geophysical investigations, to explore these ancient rocks in order to obtain a fuller understanding of the geological history and structure of this country; and in so doing a great deal will be learnt about the Mesozoic rocks. This work is of scientific interest; it is also of potential economic importance since these older rocks may contain valuable deposits. The discovery many years ago of productive Coal Measures near Dover completely concealed beneath the Chalk led to the development of a new coalfield, the Kent Coalfield.

The primary function of the Geological Survey is to make large-scale geological maps of Great Britain, which show the nature and distribution of the rocks at the surface. It is also necessary to investigate the nature, distribution and arrangement of the rocks beneath the surface for both scientific and economic reasons. The preparation of geological maps therefore needs to be supplemented by geophysical work; and the geological and geophysical surveys to be amplified and proved by a programme of boring.

LECTURE II

Monday, 17th March, 1958

Great Britain is one of the most varied and interesting countries in the world for the study of geology; many of the fundamental principles and concepts of the science have been established in this country. The maps and memoirs of the Geological Survey have provided outstanding contributions to our knowledge of the geology of Great Britain for over a hundred years; many of them have become part of the general fabric of the science of geology. There is a wide field of choice for examples of advances which are of scientific interest, such as those upon the structure of the North-West Highlands of Scotland, the Tertiary igneous rocks of Skye and Mull, the Palaeozoic and Mesozoic rocks of England and many others, but this lecture will deal mainly with the use of geological maps for economic purposes. However, it should be remembered that maps and memoirs prepared primarily for economic reasons invariably contain contributions to pure science.

Economic geology is concerned with the application of geological principles and methods to the study and investigation of natural resources; geology in relation to the needs and industries of mankind. Our natural resources call for close and continuous study; they are the foundation of our national economy; and it should be remembered that resources which seem unimportant to-day may be of great importance in the future. It may be noted in passing that the fundamental character of agriculture is controlled by climate, relief and soil, and of these, relief and soil are intimately related to geological history and geological conditions. There is a wide range of naturally occurring materials in Great Britain, such as coal, iron ore, non-ferrous ores and many minerals and rocks which are used for industrial purposes. The variety of such materials may be appreciated if it is mentioned that, excluding coal, iron ore and water, the Geological Survey has published some forty special reports upon the mineral resources of Great Britain, many of which have been revised in second, third and fourth editions. It is, however, mainly the resources that have just been excluded which will be discussed; all three have been and are vital to our economy. Coal and iron ore are the staple mineral resources of Great Britain; supplies of these essential raw materials have been the chief factors in our development as an industrial nation; and in this context water is also of prime importance.

Coal is our most important mineral; it is a primary source of heat and power; as coke it is essential in the smelting of iron ore; and there are the many other ways in which use is made of it. The annual output of coal in Great Britain is over 220 million tons, the third largest output of any country in the world, but the estimated output of 250 million tons a year in 1975 will not apparently be adequate for all our needs. We have become a considerable importer of oil; about thirty-seven million tons were imported in 1955. It is unfortunate that we do not appear to have any considerable reserves of oil; the total output of the small oilfields in Nottinghamshire and Lancashire since they first began to

produce nearly twenty years ago has been only about one million tons, but that should serve as a stimulus in the search for oil and natural gas in this country. In 1955 more than forty million tons of coal were used for the generation of electricity, and it has been estimated that by 1975 the demand for this purpose will be the equivalent of about 100 million tons of coal. The most remarkable event in this context in recent years has been the coming of nuclear power. The first full-scale nuclear reactor power-station, Calder Hall, began to feed electricity into the national grid in October, 1956. It is estimated that the nuclear power programme may save the equivalent of twenty to twenty-five million tons of coal in 1965 and possibly seventy to ninety million tons in 1975; nuclear power has arrived in time to solve many of our industrial problems. The present nuclear power programme is based upon uranium as the main fuel element. The Geological Survey is actively engaged upon the search for and the evaluation of radioactive ores both at home and overseas, but so far in Great Britain no reserves of uranium of importance have been discovered; overseas, the Survey has been associated with most of the developments in the British Commonwealth. The coming of nuclear power is rightly hailed as the basis of a new industrial revolution; in recent months, there has been the publication of the remarkable work at Harwell on thermonuclear reactions, fusion instead of fission, with great possibilities in the future development of nuclear power. However, it appears that despite the coming of nuclear power we shall need all the coal we can produce for those industrial and chemical processes which require coal itself as a raw material.

The Geological Survey is actively concerned with all the British coalfields, and geological work in them has been intensified in recent years, particularly since the unification of the coal-mining industry under the National Coal Board. The Survey has an important part to play in providing basic geological information to assist in current production and in planning for future developments. It is evidently not possible to discuss all the British coalfields and the widely varying geological conditions in them. The Yorkshire and Nottinghamshire coalfield may be taken as illustrative of the work of the Survey.

This coalfield is the largest and most productive in Great Britain; the proved area covers some 3,000 square miles and the production is more than a third of our total output. It is a partly exposed and partly concealed coalfield. The exposed portion is to the west and covers about 900 square miles; there the coal-bearing rocks are exposed at the surface, and this portion is fully developed. The concealed portion is to the east and occupies some 2,000 square miles; there the coal-bearing rocks are everywhere concealed by a cover of younger rocks; this portion is partly developed and is a most important coal-mining area. The concealed portion is thus about twice as big as the exposed portion; even so the northern and eastern boundaries have not been proved, but beyond Lincoln the coal-bearing rocks descend beneath a gradually thickening cover of younger rocks to a depth of more than 3,000 feet.

The exposed portion has been closely investigated by detailed geological mapping, supplemented wherever possible by information derived from mines

and boreholes. The succession of the stratified rocks, including the position and thickness of the coal seams, has been determined as precisely as possible, also the lateral variations in the characters and thicknesses of the rocks and the interbedded coal seams, and in addition their geological arrangement or structure. The results have been recorded on geological maps illustrated by horizontal and vertical sections, and descriptions have been given in explanatory memoirs.

The investigation of the concealed portion presents new problems because the coal-bearing rocks are underneath and wholly concealed by younger rocks. Furthermore the geological arrangement of the older Carboniferous rocks, including the Coal Measures, is quite different from that of the younger Permo-Triassic rocks; the former are folded and faulted, the latter rest discordantly on the older rocks and are inclined eastwards at comparatively low angles. The general relationship between the older and younger rocks can be inferred from the study of the exposed portion of the coalfield and the arrangement of the younger rocks; it is evident that the folded and faulted Coal Measures disappear beneath the Permo-Triassic rocks. The knowledge of the Coal Measures gained in the study of the exposed coalfield is of great value, but detailed geological work in the concealed coalfield now depends entirely upon information from mining and boreholes.

Exploration and exploitation have been active in many collieries near to the exposed coalfield, and extensive drilling of boreholes has been undertaken farther east. In addition, small oilfields have been in production since the first discovery in 1939 at Eakring in Nottinghamshire. Most of the oil produced in this country has come from these oilfields in Nottinghamshire. The oil is found in the lower part of the Coal Measures and the immediately underlying Millstone Grit at a depth of about 2,000 feet. A very large number of boreholes have been drilled in connection with the exploration and exploitation of these oilfields, all of them penetrating coal-bearing strata. This subsurface investigation by boring for oil, together with that by mining and boring for coal, have greatly increased our knowledge of the succession and structure of the rocks in the concealed coalfield.

The Coal Measures in the exposed and concealed coalfield consist of the productive Grey Measures, which are about 5,000 feet thick; they are grey mudstones and sandstones with more than thirty coal seams workable in one area or another, but the rocks and the coal seams diminish in thickness eastwards. These productive Grey Measures are overlain in the concealed coalfield in Nottinghamshire and Lincolnshire by the barren Red Measures, which are about 600 feet thick and consist of red and vari-coloured mudstones and sandstones without workable seams of coal.

The productive Grey Measures consist of a succession of minor subdivisions, each one comprising a group of strata deposited in what is called a sedimentary cycle, the normal upward succession in the cycle being coal, mudstone, sandstone and seat-earth with an average thickness of thirty or forty feet. These sedimentary cycles are not always complete, but they are repeated again and again; in the lower part of some of the cycles, marine fossils are found, whilst the rest of the

rocks and most of the Coal Measures contain only non-marine fossils. These marine bands are of great value because they are persistent over wide areas; they therefore enable levels in the succession of the rocks to be determined accurately, for example, in exploratory boreholes, and they facilitate the comparison of the succession in one area with that in another; the sedimentary cycles are also useful for more local correlations. The details of the succession in these productive measures have been closely investigated; in addition to making use of the marine bands, the non-marine fossils, particularly the mollusca, have been used to establish a detailed classification of the rocks or, as it is called, a zonal sequence; such zonal sequences based upon the non-marine mollusca have been established in all the British coalfields. The variations in the characters and thicknesses of these subdivisions have been portrayed in vertical sections and maps; similar sections and maps have been made for individual coal seams; and in addition the detailed arrangement of the rocks in the concealed coalfield has been elucidated.

There is another important problem in the concealed coalfield. The Carboniferous rocks including the Coal Measures were not only folded and faulted, but also uplifted and in part worn away, before the Permo-Triassic rocks were deposited discordantly upon them; and later the area was tilted to give the eastward inclination of the Permo-Triassic rocks. Consequently, different levels in the Coal Measures abut against or 'crop out' against the base of the overlying unconformable cover of younger rocks. However, it is possible by calculation to plot on maps the general position of some of these concealed outcrops against the base of the Permo-Triassic rocks and therefore to show the underground distribution of the productive and non-productive measures; a more detailed picture of the arrangement of the rocks at depth can be made by constructing contour maps of individual coal seams.

The Yorkshire and Nottinghamshire Coalfield is a good illustration of the shift of exploitation from the exposed to the adjacent concealed portion which is taking place in other coalfields of this type as workable reserves are reduced in the earlier exploited exposed portions. The known reserves in the exposed Lancashire Coalfield, for example, have been dwindling for many years with a decreasing annual output. Generally, the main reserves of the future are located along the eastern and southern margins where the Coal Measures plunge beneath the younger Triassic rocks which rest discordantly upon them and extend across the Cheshire Plain. Exploratory boreholes have disclosed workable coal at workable depth beneath the Triassic rocks, and important developments are taking place to win the coal. There are many other problems which might be discussed in connection with the coalfields; geological investigations are always necessary before the planning of mining developments.

Iron ores are second only in importance to coal in Great Britain. Annual production is running at just over sixteen million tons, but even so some thirteen million tons of iron ore were imported in 1955. Our reserves fall into two categories, namely, the haematite ores and the bedded or primary ores.

The haematite ores are found mainly in Cumberland and northern Lancashire,

but they are also known, for example, in South Wales. The haematite which consists of the oxide of iron occurs as lodes, veins and irregular masses in the Carboniferous Limestone. The ore is relatively rich, say from forty to sixty per cent of iron, but it is irregular and discontinuous in distribution. The replacement of structures in the limestone shows that the ore is of secondary origin; the iron was introduced by the percolation of water charged with iron. The gradual exhaustion of the haematite ores has led to a diminished production, so that to day they make up less than five per cent of our total output of iron ore.

The bedded iron ores are found within the Coal Measures and the Jurassic rocks. The clay ironstones of the Coal Measures occur principally as concretionary deposits of ferrous carbonate in the shales, and contain up to thirty-five to forty per cent of iron; rather similar ores are also known in the Wealden clays of Cretaceous age. The clay ironstones of the Coal Measures appear to have been deposited in the stagnant waters of the delta-swamps of that period, the iron having been carried there in the ferrous state to which it had been reduced in the presence of abundant decomposing organic matter. These clay ironstones were formerly very extensively worked and a hundred years ago provided about nine-tenths of the iron ore used in this country, but for various reasons very little is produced to-day.

The most important bedded ores at the present time are those found in the Jurassic rocks of central and eastern England; they provide practically the whole of the output of iron ore in this country. The bulk of the production comes from three levels in the Jurassic. The Lower Jurassic or Liassic ironstones are found in four main areas; the Lower Liassic ironstone is restricted to a relatively small area in the Frodingham district of north Lincolnshire; the Middle Liassic ironstones are found in the Cleveland district of north-east Yorkshire, the East Midland district in south Lincolnshire and Leicestershire, and the district around Banbury in north Oxfordshire. The Liassic ironstones which contain up to, say, twenty-five to thirty per cent of iron were the first of the Jurassic ironstones to be exploited on any scale in England, and for many years they provided the greater proportion of the output from the Jurassic rocks, but in more recent years the ironstone at the base of the Middle Jurassic, the Northampton Sand Ironstone, has provided more than that from all the Liassic ironstones; the Liassic ironstones, however, still provide only a little less than half of the total output of iron ore in Great Britain.

The Jurassic ironstones are silicate-carbonate rocks, which typically consist of ooliths, minute spherical grains formed by chemical precipitation in gently agitated sea water, set in a finely granular matrix. The ooliths are of chamosite, iron silicate, set in a matrix of chamosite mud, shell fragments and sand grains with also quite a high proportion of siderite, iron carbonate. When fresh, the ironstone is bluish or bluish-green, due to the iron silicate, but when weathered it oxidizes to the brownish hydrated ferrous oxide. There is no evidence of replacement, and these ironstones are marine deposits.

The Geological Survey has mapped these ironstone fields on the six-inch scale, and the Northampton Sand Ironstone may be taken as an illustration.

It occupies the largest area, which is some eighty miles long, extending from Lincoln to Towcester, and twenty miles broad. The mapping has revealed the succession in the Jurassic rocks from the Upper Lias to the Oxford Clay. Some of the variations in thickness of the Jurassic rocks are of economic importance: for example, the Lincolnshire Limestone at the top of the Inferior Oolite Series consists of 130 feet of massive limestone and is part of the cover above the ironstone band in the northern part of the field, but it is absent in the south.

The western margin of the ironstone field is in general defined by the outcrop of the Northampton Sand. The eastern margin, where the Sand is largely concealed beneath younger rocks, is necessarily less well defined. It is determined by thinning and ultimate disappearance, or by its assuming a siliceous character or by the absence of the Main Oolite Group, leaving only the poor quality of the remainder of the Ironstone Band.

The Ironstone Band is generally persistent throughout the field but it varies in character and in thickness; usually the total thickness is from twelve to twenty feet but the workable portion is commonly only seven to twelve feet. The physical and chemical characters of the Band have been carefully studied, and the bulk of the workable ore is taken from the Main Oolite Group. The iron content varies up to about twenty-eight to thirty-five per cent; it is the richest of the bedded Jurassic ironstones, all of which are of comparatively low grade.

The geological structure of the field is simple, like that of the other Jurassic ironstone fields; the strata have a gentle easterly inclination of about thirty to forty feet a mile, so that the ironstone at outcrop in the west at, say, an altitude of 400 to 500 feet above sea-level is carried beneath a cover of younger strata to less than 100 feet above sea-level at the eastern margin of the field. There are locally small faults and occasionally shallow folds, but nearly everywhere the original structural arrangement of the rocks has been modified by the development of superficial structures. These modifications disturb the regular disposition of the strata and are evidently of recent geological date. These superficial structures have been ascribed to flowage of the clays under load, but they may be the result of the special climatic conditions which prevailed during and immediately after the Ice Age in this country and which led to movements in the uppermost layers of the rocks particularly on valley slopes.

Most of the output of ironstone is at present obtained by opencast mining and there is comparatively little deep mining. The character and thickness of the rocks above the ironstone band, the overburden as it is called, are evidently of practical importance because the overburden has to be removed before the ironstone can be won. The Geological Survey has prepared maps, based upon the study of the detailed six-inch geological maps, which show the nature and thickness of the overburden, and these enable forward planning in the mining of the iron ore. In addition, considerable attention has been given to the calculation of reserves in the field. The major problems facing the ironstone industry would appear to be the gradual exhaustion of opencast reserves which may necessitate, perhaps within the next fifty years, an increased amount of

underground working and the possibility of discovering beneficiation processes which will provide a richer burden for the blast furnace.

The importance of large-scale geological maps in the development and exploitation of the ironstone fields is self-evident; they show the nature and arrangement of the rocks at the surface, and in an area of such simple geological structure the underground distribution and arrangement can be inferred with considerable accuracy from them; they are therefore valuable in problems of current production and in planning for the future.

An adequate supply of water is of vital importance for domestic, industrial and agricultural purposes; an increasing population, a rising standard of living and the demands for industrial undertakings of all kinds have meant increased consumption. There is also the possibility of an increased demand for agriculture for the irrigation of crops. Research, particularly at Rothamsted, has shown that by supplying plants at the right time with the water which they require during growth, crops are much greater than they would have been if growth had been checked at intervals by moisture deficiency. There is a rainfall deficiency in five years out of ten south-east of a line running roughly from the Humber to the Severn, and the frequency increases to nine years out of ten in the extreme south and east. It is evident that irrigation can do much to increase crop production in southern and eastern England. It is also evident that to meet this potential demand very large quantities of water would be needed; if irrigation were widely developed in southern and eastern England, it has been said that the requirement for this purpose might be equal to the present public demand. Water is essential for all life and industry; water is and will continue to be one of our most important natural resources.

Water supplies are derived from rivers, lakes the capacity of which may be increased by the building of dams, and reservoirs formed by impounding the flow of a river in its valley, and in addition by pumping from beneath the surface of the ground. The geologist can be of assistance to the civil engineer in the manifold problems connected with schemes for impounding water, particularly, for example, in the choice of sites for reservoirs and dams; in the former especially to advise upon the water-tightness of the area to be occupied by the reservoir and in the latter upon the suitability and stability of the site for the dam. He can also be of assistance in the construction of aqueducts to carry water from the reservoirs to the cities. The Bowland Forest Tunnel on the Haweswater aqueduct from the Lake District to Manchester passes beneath some ten miles of upland country south-east of Lancaster. A report by the Geological Survey dealt with the nature and structural arrangement of the rocks which would be traversed by the tunnel and their bearing upon tunnelling, the geological stability of the area both near the surface and at depth, and the water-bearing characters of the ground—all information of value to the engineer. The Survey has also investigated and reported upon many projects for the North of Scotland Hydro-Electric Board in relation to catchment areas, dam sites, tunnel lines, surface aqueducts, and so forth; once more the basis for such work is the geological map.

In the case of underground water, there is a very wide range of problems for

the geologist. Underground sources of water are controlled by the presence or absence of rocks which contain and will yield water, by their composition and texture, and by their geological arrangement. The geological map provides the basic information for the distribution at the surface of the various water-bearing and non-water bearing rock formations and for inferring their underground distribution and arrangement; this is supplemented by special investigations.

The Geological Survey has always been concerned with problems of water supply, particularly from underground sources, but during the war the demand for information necessitated an intensification of effort, which resulted in the publication of about fifty special reports on underground water. Subsequently, and partly because of the Water Acts of 1945 and 1946, a special department was set up which is concerned with the investigation of water supply problems.

A primary well survey commenced during the war has been extended over England and Wales, and since 1945 the volume of information collected has greatly increased because of the statutory obligation to notify the Geological Survey of all new boreholes and shafts for water to a greater depth than fifty feet. The positions of wells have been located on large-scale maps, with information concerning water-levels, yields, and so forth; in addition much information is collected about the quantity of water pumped by large users who also measure each year the water-levels in their wells; the effect of withdrawals of known quantities of water can thus be systematically watched. This comprehensive collection of basic information provides opportunities for the study of many underground water problems, such as the permeability and rate of movement of water within the rocks, the effects of saline infiltration by sea water, and upon the practicability of replenishing over-pumped or over-developed areas by the artificial re-charge of water-bearing rock formations.

The older rocks up to and including the Devonian which cover much of Wales and western England are unimportant for underground water supplies. They are, however, important areas for impounding schemes, such as Thirlmere and Haweswater in the Lake District, Vyrnwy and Elan Valley in Wales, whilst there are many reservoirs in the Pennines on the Carboniferous rocks mainly on the Millstone Grit. In central, southern and eastern England the Mesozoic rocks consist of alternating permeable and impermeable formations and the underground water in these permeable rocks has been extensively developed. The most important water-yielding beds are in the Mesozoic and upper Palaeozoic systems, where supplies are derived chiefly from limestones and sandstones. The largest contributor is the limestone group, particularly the Chalk, but important underground supplies occur in the sandstones, particularly the Triassic sandstones. The Chalk, the Triassic sandstones and the Coal Measures produce about eighty per cent of all the underground water pumped in England.

Owing to the need for information on the state of underground water development in many areas, special surveys are made to discover how much a given formation or aquifer can yield, and the quality of the water it can produce; these are called hydrogeological surveys. Such surveys have been completed for much of the country occupied by the Chalk and the Triassic sandstones. Briefly,

the contours of the water table in the aquifer are constructed, the amount of replenishment by rainfall is determined and the loss by flow from springs and by pumping are estimated in order to ascertain whether or not water is available for future development; in effect such surveys strike a balance sheet for the water-bearing formation. The value of these surveys is evident in the planning and development of underground water resources.

It is not possible within the limits of this lecture to discuss other materials of economic interest despite the significance of many of them in our economy. Comparatively little lead, zinc and tin is produced, but close attention has been given to areas which might repay further consideration, as, for example, the north Pennines and south-west England, upon which comprehensive memoirs have been published. There are important reserves of such minerals as fluorspar and barytes and many other materials such as china clay. There are extensive deposits of rock-salt, anhydrite and gypsum in midland, northern and southern England and in the context of these evaporites mention may be made of the discovery in 1939 of potash salts in north-east England.

Since 1941 the Geological Survey has been concerned with the investigation of raw materials for atomic energy, and a special department, now called the Atomic Energy Division, has been set up for work on radioactive ores; the activities of the Division, which collaborates very closely with the United Kingdom Atomic Energy Authority, have greatly increased since then. The work of the Division is not confined to this country; it is heavily committed with overseas investigations in association with prospectors, mining houses and Geological Surveys; there are few occurrences of uranium and thorium ores in the Commonwealth which have not been visited and reported upon by officers of the Division. It gives advice on the value and possible development of radioactive ores; this involves both field work and the testing of materials by all available methods in the laboratory. Many of the methods of prospecting for other metals are used in the search for uranium and thorium, but the most important aid is a Geiger-Müller counter or a scintillometer; a great deal of work has been done on the development of portable ratemeters and upon equipment which can be installed in motor cars for rapid reconnaissance over extensive areas; airborne radiometric surveys have been widely used; radiometric logging of boreholes is practised; and in addition a good deal of attention has been given to geochemical prospecting where the rocks are covered by a thick mantle of superficial deposits. In the laboratory, attention has been given to new developments in radiometric instrumentation, new techniques of radioassay and autoradiography, and to the perfection of more precise methods for the identification of radioactive minerals. There is no need to stress the importance of this work in relation to the production of atomic energy for power purposes.

The Museum of Practical Geology contains a large amount of material on display and it is open to the public. The exhibited collections are designed to illustrate the principles of geology, the regional geology of Great Britain and the economic mineralogy not only of this country but also of the more important regions of the world. Guides to the collections have been published, and attention

is drawn particularly to the publications which deal with the regional geology of Great Britain. The reserve and study collections of rocks, minerals and fossils are in constant use by the staff, but they are also available to accredited workers from this or any other country. The care and maintenance of these large collections devolve upon the staff of the Museum, who also undertake investigations of various kinds. The Library, which is a public reference library, contains an extensive range of books, journals and pamphlets on geology and ancillary subjects, and an especially representative collection of geological maps not only of Great Britain but of most countries in the world.

The Geological Survey and Museum form a national repository of geological information for the service of Government departments and a wide range of other bodies. There continues to be an increased volume of inquiries and requests for special investigations; and advisory work forms part of the activities of every section.

The primary function of the Geological Survey is to prepare and publish geological maps with explanatory memoirs, which may be of service to science and to industry. There are no sharp boundaries between the purely scientific and applied aspects of geology; as someone has said—'the more exact our knowledge of the position and sequence of the rock formations, the more certain our economic explorations become; and the more successful our industrial adventures, the greater will be the impetus given to the extension and exactitude of scientific research.'

LAND PLANNING IN AN EXPANDING ECONOMY

A paper by

J. R. JAMES, O.B.E.,

of the Ministry of Housing and Local Government,

read to the Society on Wednesday, 5th March, 1958,

with Lady Brunner, J.P., in the Chair

THE CHAIRMAN: Mr. James has every qualification to speak on the subject before us this afternoon. He has considerable service in the Ministry of Housing and Local Government, and he spent several years on Tyneside engaged in practical planning there. He is at present Senior Research Officer at the Ministry in London, but he is about to be promoted to the post of Deputy Chief Planning Officer. That promotion will take place in May, and I am sure we should like to wish him very great success in the new work which is going to be his in the near future.

The following paper, which was illustrated with lantern slides, was then read:

THE PAPER

INTRODUCTION

In the post-war years we have been aware of numerous, heartening signs of the changed economic and social conditions—better clothing, improved medical care, clean lines of new schools and factories, and large areas of new housing. These are evidence of full employment, greater and more widely distributed wealth, and more social equality. But the new conditions have also produced their own problems for which we were not well prepared. For example, the large increase in the number of motor vehicles creates congestion of our main roads and city centres, and extreme pressure on parking and garage space; holidays with pay produce a flood of caravans along much of our coast; factories, houses and schools use up valuable agricultural land.

ECONOMIC AND SOCIAL CHANGES

Foremost of the economic changes has been a 40 per cent expansion in the national output of manufactured goods since 1948. This has been achieved partly by an increase in the labour force, especially the greater employment of women, but even more by the growing use of mechanical and automatic aids to production. It has made possible the vitally important expansion in exports and also additions now worth over £3,000 million a year to our capital equipment of houses, schools, factories, power stations, road vehicles, ships and plant and machinery of all kinds. Expenditure on such capital goods is about one-sixth of the national income, a proportion somewhat larger than before the war, but

smaller than in France, Germany and the United States, and still, some people say, insufficient.

The expansion in output, exports and investment has had large and direct effects on land use, but perhaps even more important have been the indirect effects arising from the improvement in the economic position of the lower paid members of the community. No doubt there are still families with inadequate incomes, but the average weekly earnings of workers in manufacturing industry have gone up nearly fourfold since October, 1938. In the same period retail prices have increased about 2½ times. The net result is that real earnings are higher by about 50 per cent. One can cite numerous examples of what this means—the increase in private motor cars from one for every 24 persons in 1938 to one for every 12 to-day, or the production last year of 80 million gramophone records and 500 million Christmas cards, or the fact that one family in two now has a television set. It is all leading to a flood of applications to build consumer goods factories, especially in the London and Birmingham areas.

SCIENTIFIC AND TECHNICAL CHANGES

Important developments in the techniques of production have accompanied and to some extent accounted for these changes. Production is now becoming almost wholly automatic in some industries, particularly in oil refining, the production of petroleum chemicals, steel, motor vehicles and paper, and in some food and assembly industries. Scientific discoveries have also led to altogether new materials and products. In a world which takes television sets and washing machines for granted, uses detergents daily, buys a host of plastic products and clothes made of nylon, terylene, and other man-made fibres, it is easy to forget that these were almost unknown before the war. A wealth of new products is now used by everyone.

New processes and products sometimes involve spectacular new structures such as the steel sphere containing the fast nuclear reactor unit at Dounreay, Caithness, the radio-telescope weighing 2,000 tons at Jodrell Bank, near Manchester, and the huge dragline being used in the extraction of iron ore at Exton Park, Rutland. Television implies transmitter masts, and other forms of telecommunications a network of tall towers. In many industries, also, there is a tendency to very large installations, such as the cracking units at oil refineries, giant blast furnaces, the new strip mill at Margam, three quarters of a mile long, and the new power stations.

IMPLICATIONS FOR LAND PLANNING

The consequences of these industrial and social changes are demands on land greater and more varied than ever before. Every year some 30,000 acres of farmland are going over to another use. The important thing, however, is not the size of this change, which over a twenty-year period will amount to no more than 2 per cent of our agricultural land, so much as its nature and location. The problem is to satisfy our material requirements while creating new and

pleasing forms in our towns and countryside. The remaining part of this paper is concerned with the effect on land use of modern demands for power, minerals holiday centres, roads, and more spacious living, and with shifts in the distribution of population, particularly out from our great cities.

(i) *Power*

Coal is likely to remain our chief source of energy for many years to come. Although developments in the field of atomic energy are rapid, nuclear power will not supplant it for a long time. The target for the annual output of mined and open-cast coal is 240 million tons in 1965. Last year 13½ million tons of coal were obtained by open-cast methods. To import this would have cost about £100 million, mostly in dollars. The impact on our land is large: 109,000 acres have been taken over since 1942 and about one-half of them have been dug up. Every acre, however, is restored. There are some complaints of the disappearance of hedge-rows, ineffective drainage and loss of soil fertility, but on the whole the work is skilfully done. The result is much better than the subsidence hollows, spoil heaps and pit-head gear which usually disfigure the coalfields.

The thriving mining areas owe much to the vigorous pursuit in the first few years after the war of the Development Area policy. They owe even more to the continuing demand for as much coal as can be got. Great sums are being invested in mechanization and the sinking of new, deep pits, but at the same time many of the older collieries on the flanks of the Pennines are coming to the end of their lives. So, too, are many of the mining villages, small communities left stranded by the receding tide of activity. The migration of young people from old coal-mining districts is, however, not nearly as rapid as before the war and there is a clear appreciation by planning authorities of the part they can play in stemming this drift.

Electricity Generation. Nothing tells the story of our economic expansion more clearly than the increase in the consumption of electricity. In 1947–8 we used 33,000 million units; in 1956–7 the figure had doubled. Figure 1 shows the concentration of generating stations in the North-East, the West Riding, Lancashire, South Wales, and especially the West Midlands and Thames-side. The steel pylons of the 275 Kv and 132 Kv transmission lines arouse the concern of lovers of the countryside and the anger of some farmers, yet they bring great benefits—and not merely to industrialists. The progress of rural electrification has been very satisfactory. Some four out of five houses in rural areas are now supplied; the number of farms connected to the public supply has more than doubled in the last ten years and it is expected that 85 per cent will be connected by 1963. A quiet revolution during the past ten years has extended electricity, and other public services as well, widely throughout the countryside.

In two areas there has been outstanding progress in building coal-burning power stations. The first is along the Trent (Figure 2), between Burton and the Humber estuary, where eight new stations will form the largest single concentration of new generating capacity in Great Britain. They make use of the cheaply mined and relatively low-grade coal of the neighbouring East Midlands

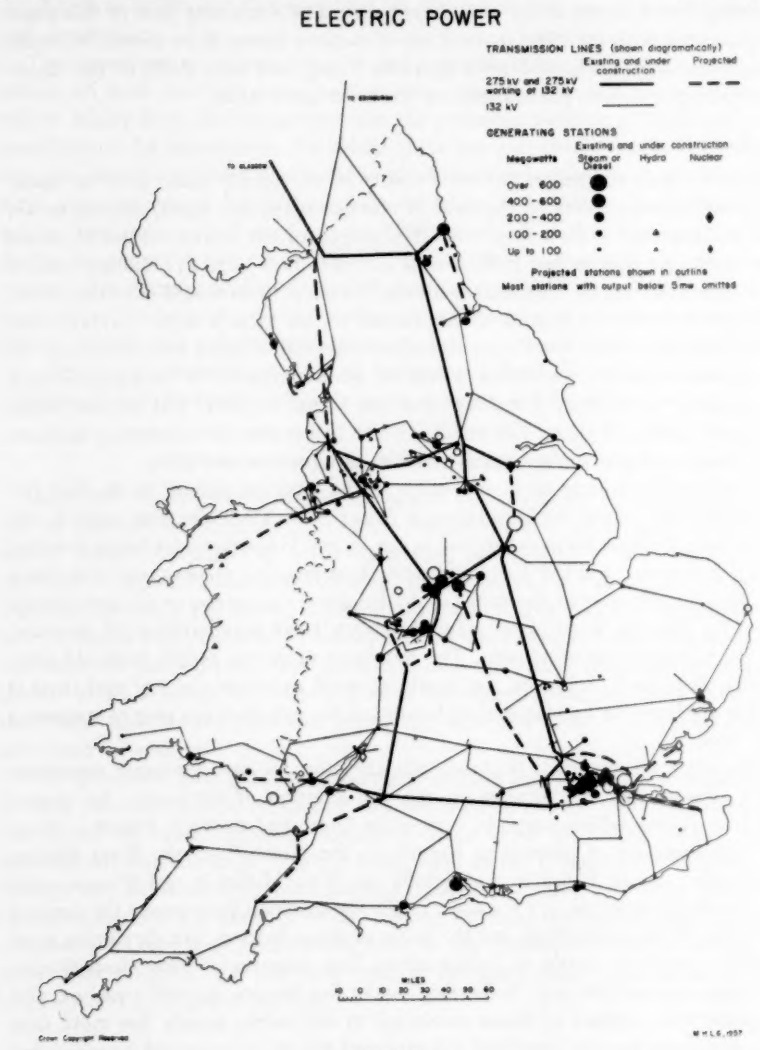

FIGURE 1

field and of the largest reserve of cooling water in Eastern England, the Trent. The problem of disposing of fuel ash is growing daily. In England and Wales nearly 7 million tons are being produced every year from coal-burning stations, half of it in the form of fine dust. In the Trent Valley some is going to fill disused gravel pits, but it is difficult stuff to handle and transport. It is often pumped as slurry for distances of five or six miles. Ways have been discovered of using

it in making bricks, light-weight aggregate and concrete-type blocks, but its economic use is still small.

The second area is Lower Thames-side, where new and extended power stations, cement works and oil refineries are taking up long stretches of river frontages. These continuously discharge sulphur dioxide into the air; the price of power, here, is that a once-clean atmosphere will eventually be as polluted as that of Central London. At present the only practicable way to diminish the pollution is to build chimneys taller and taller. Some are now 500 feet high. If, however, power were being provided by a multiplicity of small units close together, as was common practice before the war, conditions would by now be intolerable.

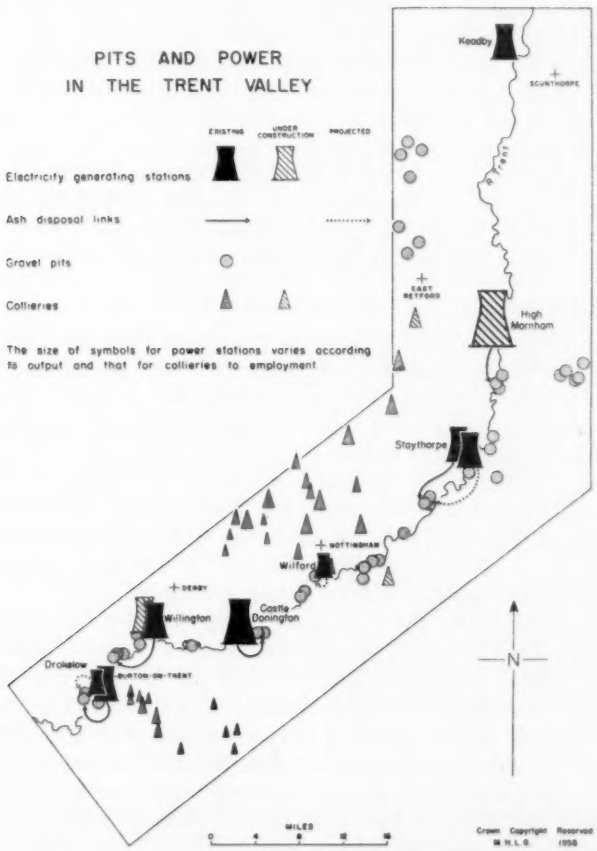

FIGURE 2. *This map shows the relationship between the power stations in the Trent Valley, the collieries which supply them with fuel, and the gravel pits, some of which accommodate the powdered fuel ash*

Nuclear power stations are already beginning to make a real contribution to the supply of electricity. By 1965 they will generate nearly a quarter of the total supply, and thereafter will gradually replace coal-burning stations. Calder Hall in Cumberland is already contributing modestly and three stations are now being built, at Bradwell in Essex, Berkeley on the Severn and Hinkley Point in Somerset. Others are proposed at Trawsfynydd in the Snowdonia National Park and on the Lleyn Peninsula. These are immensely heavy structures of concrete with the thirst of Odin, and may stand as Ancient Monuments long after they have ceased to be useful.

The Petroleum Industry. Part of the answer to the rising demand for power lies in importing more oil. Before the war there was not a single refinery in the country with a capacity of one million tons per annum. There are now eight, and others are contemplated. A modern refinery is a great land and water user, but it employs few men. It requires sheltered, deep-water anchorage for its oil carriers. Tankers have risen in size to reduce the heavy burden of transport charges, and the big companies are now thinking in terms of the 65,000-ton vessel and are even ordering some in the 100,000 ton class. These monsters need a minimum depth of 53 or 54 feet of water and a turning circle about 1,100 feet across. There are very few estuaries outside the Western Highlands which can provide such conditions. This is the outstanding reason why Milford Haven in the Pembroke National Park is to be used by Esso and B.P.

(ii) *Minerals*

Every time you see a building going up, a road being laid, a car moving past, an electric light being switched on, it means that some mineral somewhere or other has been dug out of the ground. The price we are paying is the taking over of more than 3,000 acres of land every year, quite apart from the land for open-cast coal workings. Half of these acres, after exploitation, will be reclaimed; the remaining half are more intractable—deep clay workings in Bedfordshire, limestone scars in the Pennines, chalk pits in the Downs, roadstone quarries in the Malverns. The point to be stressed is that mineral operators are satisfying essential needs of an expanding economy and, in growing co-operation with planning authorities, are now reclaiming land at substantial cost.

The production of sand and gravel has gone up by over 4 million cubic yards in the Greater London area since 1947. Local supplies will be exhausted within a few years unless first-class agricultural lands are invaded. The alternative, in some ways preferable, is to pay a higher price for sand and gravel brought from the Vale of St. Albans. There is good reason to suppose that the wet workings which at present disfigure so much of the West Metropolitan Area will eventually be filled in. They now total over 1,600 acres; 600 acres have been added in the past ten years and 400 have been filled in. Dry workings present no problem; they are usually reclaimed immediately after the gravel is dug out.

The growth of the steel output from 13 to 22 million tons in the last ten years has had a profound effect on raw material extraction. The Jurassic ironstones stretching from the Cleveland Hills to the south Midlands began to be important

in the middle of the last century. To-day the resources of Cleveland are very small, and the mining communities there are declining; but Scunthorpe and the new town of Corby on the Midlands field are growing apace. It is here that huge excavators are taking over 450 acres of land every year in the getting of over 12 million tons of ironstone. Before the passing of the Mineral Workings Act in 1951 open-cast operations had left a desert of over 2,000 acres; but from that time on levelling and top-soiling have followed immediately upon the getting of the ore. In addition, the backlog of abandoned land has steadily been reclaimed at a rate of from 200 to 300 acres per annum. No one who has studied the efforts made by the big steel companies, the local authorities, the Ministry of Agriculture and the members of the Ironstone Standing Conference can withold tribute to their achievement. But their problems will become more and more complex as demand for home-produced ores rises from 16¼ million to 22 million tons over the next five years, and as workings encounter an overburden well over 100 feet thick.

(iii) *Holiday Centres*

Increased earnings, greater leisure and changing social customs are clearly reflected in the number and kind of holidays people take. In 1936 2 million workers had an annual holiday with pay; to-day 14 millions do so. About 25 million people altogether take a holiday away from home. And whereas before the war the typical demand came from middle-class families going by rail to well-established seaside resorts, more than half of the present holiday-makers go by road, about 3 million of them to caravans and holiday camps of various kinds. The nature of the problem is exemplified by the stretch of coast from Point of Air to Colwyn Bay along which, every year, more than 160,000 people take a cheap, seaside holiday away from the industrial towns of Lancashire and the Midlands. Some 800 acres of land are used as camping grounds, fronted by long beaches of pebble and sand and backed in part by mountains. Unfortunately there are many shack areas, developed before the days of planning permission, which can only be cleared up at very heavy cost to the local authorities.

The demand for more and more sites appears insatiable. It must be met in a decent and orderly way, with proper provision of water and drainage and with thought for preservation of natural beauty. There are many people who dislike the sight and idea of caravans. So do some planning authorities; but whatever their private views they have the extremely difficult duty of providing for the growing needs of holiday-makers in such a way that general enjoyment of the coast or country is not spoiled.

(iv) *Roads*

Except for Belgium, there are more miles of hard-surfaced road per square mile in England and Wales than in any other country in the world; the figure is 2·75 against, for example, 0·71 in the United States. But we have not added significantly to our main road system since the war although the number of vehicles has risen from 3 millions in 1938 to 7 millions to-day. If economic and

social trends of the past nine years continue, and if our road system permits, we may have 14 millions by 1966.

Traffic density has doubled in the last ten years and is likely to do so again in the next ten. Unless traffic can be made to flow much more freely this will involve economic loss and increasing danger to life. At a conference held in November of last year on the Highway Needs of Great Britain it was estimated that an expenditure of £3,500 millions was required over the next ten years. A system of motor-roads is planned, and details have been published for the first part of the London-Yorkshire motorway, the 53-mile stretch of three-lane dual carriage-way from St. Albans to Dunchurch near Rugby. This section is due to be started in March, 1958, and to be finished in only 19 months, providing an excellent example of the application of modern methods of construction to modern needs.

It is in towns, however, that the greatest congestion occurs and that problems are most intractable. The sum of £1,000 millions is said to be needed for urban roads, but there is more to it than this, for further costs will be incurred in providing parking spaces and for the disturbance of valuable frontages. Moreover, the work must be done in such a way that the character of beautiful cities is not impaired. A case in point is Oxford, where the possible effects of driving an arterial highway through Christ Church Meadows in order to reduce traffic congestion in the High have caused much concern and hesitation.

(v) *Space Standards*

The Development Plans prepared under the 1947 Town and Country Planning Act have made provision for an increase over a twenty-year period of 40,000 acres for industrial purposes, but this is certainly less than the total that will be needed. The magnitude and tempo of change, and especially the pressure on estuarine land, is only now becoming clear (Figure 3). Tees-side provides an excellent illustration of the extensive land demands of modern industry. Here, 740 acres, mostly of reclaimed land, are ear-marked for a five-berth dock to import chemical raw materials, iron ore and oil; Dorman Long have spent over £60 million in the area since 1947, building new steel works; I.C.I. have spent over £70 million on their 2,000 acres site at Wilton, apart from their other expansion at Billingham; the South Durham Steel and Iron Company proposes to spend over £40 million for new integrated steel works on a 536 acre site near West Hartlepool. Much the same sort of thing is happening on the Humber estuary, Thames-side, Southampton Water, the Bristol Channel, the coastal lands of South Wales, and the Mersey. These spectacular developments represent a 70 per cent increase in steel capacity, a virtually new oil-refinery industry, and a large expansion in chemicals, engineering, motor vehicles, electrical goods, plastics and man-made fibres.

Space standards for new homes are a perennial subject for controversy. The Development Plans propose an increase of five acres of residential land for every thousand people throughout England and Wales. This is not a high price, though it is only a first payment, for housing a growing population, and for replacing

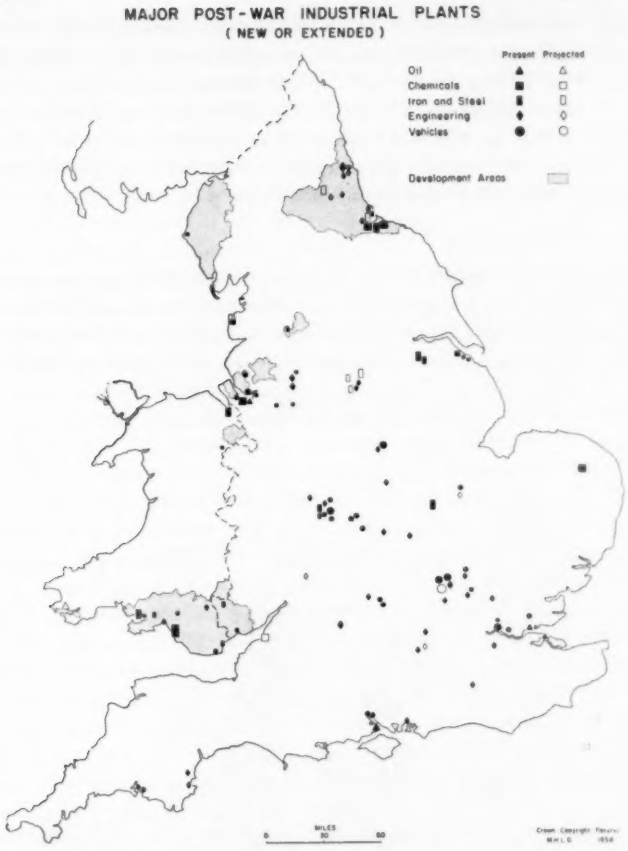

FIGURE 3. *Major industrial developments. The symbols are graded according to output in the case of oil refineries, and according to floor area in other cases. Only those plants exceeding 250,000 square feet and employing more than 500 people, or thereabouts, are included. Plants under construction are included under 'present'. The Heysham oil refinery was built during the war, but has been included to complete the picture of oil refining*

many of the interminable rows of unfit houses in our great industrial cities. The houses now being built are intended to last at least sixty years, but the choice of materials and of the standard of space provided depends on what we can afford at the moment. If the hope that we shall double the standard of living in 25 years* is fulfilled, they may not then seem adequate. The dilemma is inescapable. Should we have built fewer but better houses since the war? One thing is sure. A growing demand for the detached house in the countryside has arisen out

*Statement by the Rt. Honble. R. A. Butler, C.H., in an address to the Conservative Party Conference, October, 1954.

of the more even distribution of wealth and greater mobility. This social trend is much more widespread, continuous and powerful than has so far been generally recognized. If given free rein it will rapidly destroy Green Belts and alter the character of open country beyond. The Minister deals with well over 1,000 appeal cases a year on this score alone. The pressure cannot be reduced by planning action, but it can be guided and contained if local authorities adopt and act upon a firm policy of compact development.

(vi) *Population Movements*

The population of England and Wales continues to grow: 200,000 people have been added every year since 1951. The early post-war increase in the birth rate is now resulting in pressure for more secondary schools and will soon be augmenting the labour force. For economic and social reasons which cannot

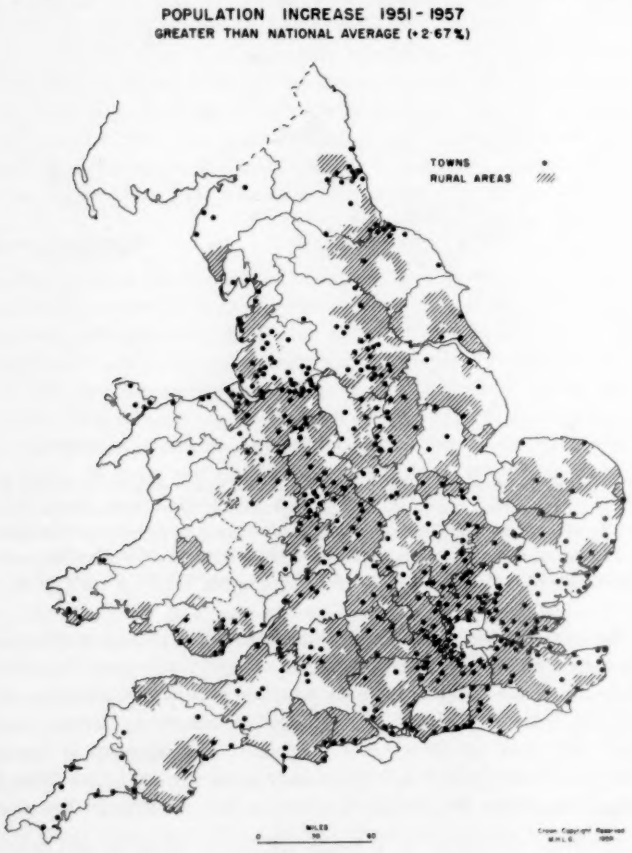

FIGURE 4

easily be distinguished, there has been a surprising secondary but sustained increase in the birth rate during the past two or three years. It is estimated that the total population of England and Wales, now 44·4 millions, will increase by nearly two millions before 1971, a figure little different from the combined populations of Liverpool, Manchester and Sheffield. There is at present no evidence that the pressure of this new population on our land will be appreciably reduced by emigration. We read of families migrating overseas, but this country still provides asylum for refugees and receives many people from the Commonwealth; the net result is small.

The general picture of how population is distributed is familiar and needs no comment. What is less well known is how the picture is changing. Figure 4 shows those urban areas and rural districts where there has been a greater than average increase in population. Broadly speaking, there are two main forces at work. First, there is the changing pattern of employment. Many industries need no longer be concentrated on the coalfields as they were in the last century. Estuary or coastal sites which provide wide stretches of undeveloped flat land and large quantities of cooling water are assuming greater importance than ever before. They attract labour from rural areas or from the coalfields where old, staple industries such as textiles now need fewer workers. Farms, while more than maintaining their output, have lost nearly 170,000 workers since 1947 and the primary population in the countryside has declined; but the net migration of people from rural areas is not so widespread or intense as it was before the war. In a five-year period during the 1930s 52 per cent of all rural districts were declining, and the loss was 3·6 per cent. In the first five years after the 1951 census the corresponding figures were only 30 per cent and 0·5 per cent. Even more important than the estuarine development is the continuing growth of the Midlands and the South-East. In terms of employment, though not in terms of acreage, the expansion of the manufacturing industries in these areas dwarfs the increases in oil, chemicals and steel.

The second force is the gradual decongestion of the inner cores of the conurbations and other large industrial towns, giving rise to a transfer of families from the urban centres to their suburban fringes. This movement is voluntary as well as planned, and it is happening not only in our cities, but in every great city in the western world. Where these two main forces, viz., the coming of new industries and the outward flow of population, operate together as they do around London and Southampton and Portsmouth, land use changes very rapidly.

(vii) *The Conurbations*

The conurbations are at different stages of evolution. A number of areas such as Tees-side, the lower Thames-side towns and the extensive South-Coast urban fringe, particularly the Southampton-Portsmouth area, have not yet reached full conurbation status. But they are growing rapidly and, judging from modern trends, they may well be in the Registrar-General's list of conurbations by 1971 or 1981. At the other end of the evolutionary scale are Tyneside, the West Riding

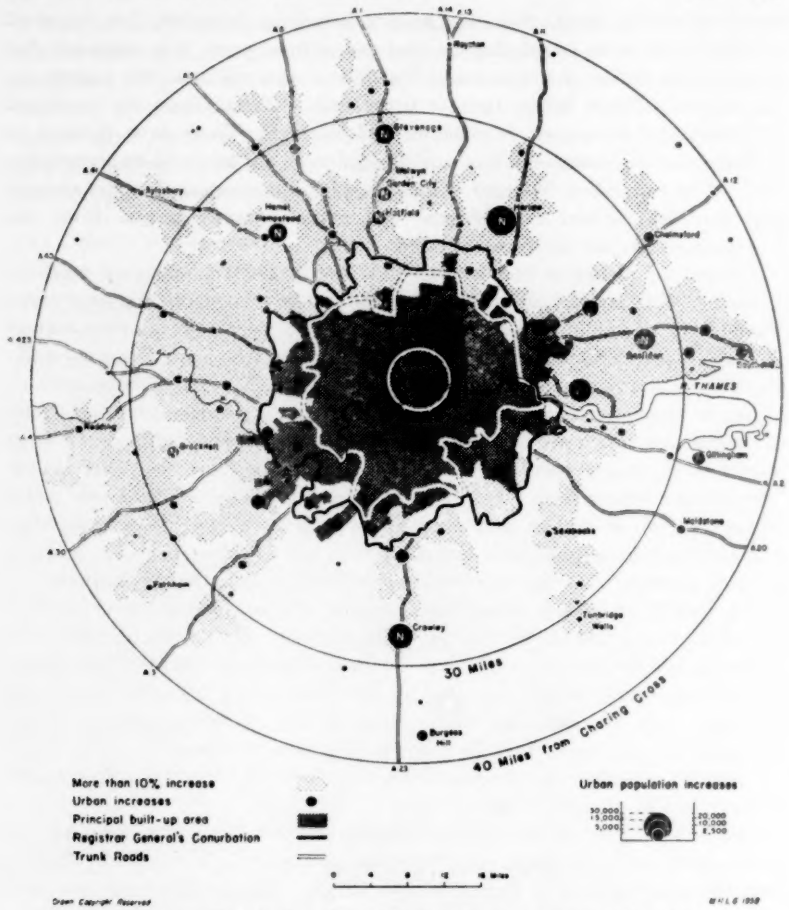

FIGURE 5. *Greater London population changes, 1952–6. The white line encloses the area within which population is decreasing generally. The white outlined circle is proportionate to the net amount of this decline, as the black circles are to the population increases in the expanding urban areas. New Towns are distinguished by the letter N*

group of County Boroughs, and Greater Manchester. These are in their old age; their employment and population have ceased to grow, but they are still expanding to meet the space requirements of the mid-twentieth century. The need for land of all the old conurbations is due mainly to the condition of the many thousands of houses which were hurriedly built there during the middle and latter part of the nineteenth century. In Manchester their condition is now so appalling that they are falling down at the rate of 700 a year.

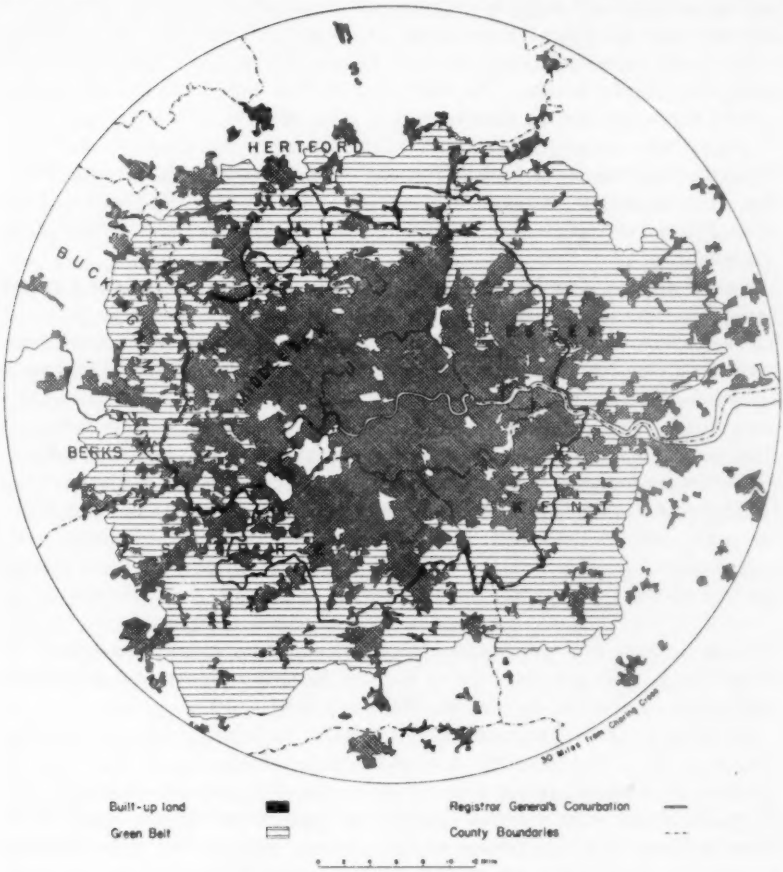

FIGURE 6. *The London Green Belt*

The Birmingham and Black Country conurbation belongs to a third category. It is large and mature and still full of power. There is no weakening of its main industries—engineering, metal goods and the making of motor cars. Up to the end of 1957 some 20 million square feet of factory space had been added to it since the war. But for planned dispersal this total would have been 30 million; by August of last year 99 firms had moved out to other parts of the country, and a further 75 were moving to reception areas within the West Midlands. Birmingham, itself, like the heart of most mature conurbations, has stopped growing, but the population of the rest of the region has increased by 9 per cent since 1951. The problem faced by the planning authorities of the West Midlands is to find suitable areas in which to house 200,000 people from Birmingham.

The conurbation still contains undeveloped land, and the number of reception schemes under the Town Development Act, mostly in Staffordshire, is increasing.

The battle to defend the Green Belt between Birmingham and Coventry is being energetically fought. The Warwickshire Planning Authority has already refused permission for the development of 6,870 acres, or over ten square miles of Green Belt country. Up to October, 1957, some 550 applications had been rejected. Altogether these proposed to add 40,000 houses, 592 acres of industry and 33 petrol-filling stations, 14 of them on the Coventry-Birmingham road alone. Of the 111 appeals to the Minister concerning this area, only 18 have been successful.

Greater London. The forces which brought together one-fifth of the national population into Greater London in pre-war days are once more in evidence. The expansion of the metropolis is now affecting areas forty miles or so from Charing Cross. No other conurbation is growing so extensively. The causes are plain: the increase in office work; the growth of the oil, paper, power and cement industries of Lower Thames-side; the development of London Airport employing 25,000 people; and above all, the great expansion of general industry which derives strong trading advantages from the metropolitan market. During the four-year period 1952–6 the increase in employment in England and Wales was 4 per cent; in five square miles of Central London it was probably 7 per cent; in the remainder of the conurbation, 7 per cent; in a ten-mile belt around the conurbation, 15 per cent; and in a belt, 25 to 40 miles from Charing Cross, 7 per cent. In all, 318,000 workers have been added to the economy of a Greater London in these four years alone—43 per cent of the national increase in the labour force. With the exception of Crawley in Sussex, growth has been most rapid within and to the north of the Thames Valley.

Recent population changes are clearly revealed in Figure 5. The conurbation, defined by the heavy black line, lost 90,000 people from 1952–6. This figure is made up of losses of 145,000 from the area enclosed by the white line and gains of 55,000 in the outer suburbs. Beyond the conurbation up to 40 miles from Charing Cross there has been a gain of 310,000, more or less to be found in a continuous belt within and immediately beyond the Green Belt, where almost every town and village west, north and east of London has grown by more than 10 per cent.

Two points need to be made. First, increase of employment and decline of resident population in the centre mean that more and more people are travelling daily farther and farther to work. It is this growing travel problem that has led some people to advocate redevelopment which will provide more homes rather than more office space in the City. Secondly, these statistical facts reveal an enormous pressure, against which the planning authorities are contending in order to prevent the Green Belt and agricultural land beyond from being submerged under sporadic development. You cannot see their successes, only their failures; but a study of planning permissions and refusals is most revealing. Maps which have been prepared show how Buckinghamshire, for example—characteristic of the planning authorities in the Home Counties—has resisted

building proposals throughout the Green Belt. Here and there, possibly for very good reasons, exceptions have been made and development allowed, but the policy of compact settlements and island centres within the Green Belt is plain to see.

CONCLUSION

What conclusions can be drawn from this necessarily brief review? First, the heavy pressure on our land is going to continue. The demands for better homes by many people who have never lived in reasonably sized houses with their own gardens, will cause our towns and cities to expand. Even now there are only a handful of County Boroughs which can afford the six acres of playing fields per thousand of the population that is regarded as a desirable minimum standard at present. If, in the future, the working week is shortened, then this standard may be considered too low. More motor cars mean more parking space, garages and better roads. The demand for more skilled workers means more technical colleges and centres of further education. Longer holidays mean more land for recreation. More automation, upon which a rise in productivity depends to a very large extent, means more factory space per industrial worker. Our agricultural land will contract slightly, but this need not cause dismay. It is productivity not acreage which matters, the bushels of wheat not the size of the field. All these trends were well established in the past decade. There may occasionally be serious setbacks to our economic prosperity, but it is unlikely that these social changes will be more than temporarily checked.

I have little patience with those gloomy commentators who denigrate British industry, British workers, British planning, new towns, the policies of population dispersal, and so on. Criticism is essential, but let it be well informed and constructive. Let such people pause for a moment over the 40 per cent increase, in real terms, since 1948 of our manufacturing production, or over the fact that with fewer workers on less land we are now producing more than half as much foodstuff again as we were before the war. Or, if figures do not impress them, let them contemplate for a moment the skill and technical achievement which lies behind the building of atomic power stations; or spend a day or so in visiting the Welsh valleys and contrasting present living conditions with those of the 1930s; or let them consider the ability, effort and saving which have gone into the development at Tees-side.

The achievements in which most planning authorities can take greatest pride often pass unnoticed. Many exhausted mineral workings which would formerly have gone to swell the total of over 130,000 acres of dereliction are now returned to some useful purpose and leave little trace of exploitation. Well farmed land is being safeguarded far more rigorously and thoughtfully than ever it was during the past hundred years. This is one of the main tasks of planning authorities. How extraordinary it is, then, that planners are so often accused of disregarding the quality of agricultural land. Further, in a never-ending battle of planning application and refusal, the Green Belts around our great cities are being held. Forces which are too powerful to be checked are leading to the continuous

expansion of our cities, but these are no longer growing in an unregulated manner.

Yet no one of us can say with Dr. Pangloss that everything is for the best in this best of all possible worlds. There are signs of deep strain in our economy. We live on a knife edge, the fear of inflation on one side, unemployment on the other. We are also still largely ignorant of where the balance of social and economic advantage lies between a strictly controlled policy of industrial location on the one hand and an ever-expanding Birmingham and London on the other. Here is a subject of study on which economists might have a great deal to say but have so far said very little.

Lastly, although in material terms the national achievement has been great, the relative neglect of spiritual and aesthetic values is indisputable. To win more open-cast coal, erect more power stations and build more spacious homes is economically necessary and socially desirable. These are all good aims. To defend beautiful country and safeguard fine buildings for future generations are also good aims. The difficulty is that people who care about what is happening —far too many are indifferent—put themselves into opposing camps. This division of opinion is not a new thing, but it is as deep and wide as ever; and it will remain so unless there is more determination to think together to find an answer to the whole problem and not to separate parts of it. By common consent care is now being taken to reinstate land which has been worked for minerals, and a deliberate effort is made to prevent scattered housing development: this is a hopeful sign that reconciliation is possible. It is this need to find harmony or, where that is impracticable, the right objective, which is the real challenge, and it is a challenge to all of us.

DISCUSSION

THE CHAIRMAN: I think the warmth of the applause is a tremendous tribute to the speaker on a subject which is so far-flung, so complex, and one about which I am sure every person in this room feels ready to do battle! Throughout the address one was aware of the conflicts that inevitably must go on, considering the various interests with a stake in the planning of our countryside and our industry.

MAJOR W. V. G. FUGE, M.B.E.: It is exceedingly cold in Northumberland in winter. May I ask the lecturer whether in the new villages the houses have walls as thick and solid as those in the old villages? Secondly, is there any planning for the painting of gasholders and oil tanks? In the picture shown us of the oil refinery in Pembroke the tanks were painted white.

THE LECTURER: I am afraid not. Like you, I love the thick solid walls of stone of the Northumberland villages. But can you find the craftsmen to-day, or the people who are prepared to pay for building houses in traditional style instead of in the ubiquitous and standard-size brick which is spreading everywhere and killing the local idiom? Secondly, I think you will find that all planning authorities are very well aware of the need for discrimination in the use of paint, particularly, as you say, where gasholders are concerned.

MR. H. R. W. RABSON: Can the speaker tell us whether he thinks that land reclamation has an important part to play in the planning of the country, particularly on the East Coast?

THE LECTURER: By land reclamation do you mean the bringing into use of land which has never before been used—reclamation of washes—or the reclamation of derelict land?

MR. RABSON: Reclamation from the sea.

THE LECTURER: Indeed, I do think it important. We have within this country several hundreds of thousands of acres which could be brought into first-class agricultural use if we were able to invest money in reclaiming them. It is very significant that among the best soils we have in this country are the reclaimed soils of Chat Moss in Lancashire and the reclaimed soils of the Fens, both of them man won. We, of this age, can equally make first-class soils—the Dutch are doing it—and for a one per cent return it may be worth while. I am convinced that, purely from productive points of view, it is far more worth while to do that than it is to spend large sums of money on reclamation of abandoned industrial land; though, of course, there is an important aesthetic value to that activity.

MISS ELIZABETH SANDARS: I live in north Oxfordshire, in one of the areas which is threatened with iron-ore mining, and (I wonder if I am right?) I have been made to feel that we would not only be fighting a losing battle, but that we ought not to fight at all, to try and close the iron ore workings. But all the inhabitants are extremely upset, and I would be glad to know whether the lecturer really feels that the national interest is so vitally concerned in this matter that one ought not to oppose either the destruction of agricultural land or the spoiling (or ruin) of beautiful country, the loss of magnificent trees, and danger to surface springs.

THE LECTURER: Which part of north Oxfordshire?

MISS SANDARS: Around Little Tew.

THE LECTURER: I know the area. An application was made by the Oxfordshire Ironstone Company for the working of a very extensive area, six to eight square miles in size, just to the north of the Great Tew Estate. Little Tew, itself, lies outside the application area, probably for the very good reason that the quality of the ironstone is here uncertain and the over-burden is very thick. I think you can therefore sleep contently—for tonight at any rate.

MR. P. W. MACFARLANE: I believe there is discussion in progress as to the best site for a very large new steel works, and sites have been canvassed in South Wales, the Scunthorpe area and elsewhere. It would be interesting if the speaker would tell us, taking both the social and planning aspects into account, what he considers to be the best site for this steel works.

THE LECTURER: This is a matter under discussion by Ministers and it would therefore be improper for me to venture an opinion. Among the principal facts to be taken into account are the interests of Richard, Thomas and Baldwin, the proximity of the new works to indigenous or imported iron-ore, the need for a large, flat and stable site, good quality coking coal, vast quantities of water, efficient transport and a large labour force. The employment needs of different parts of the Country are also very important.

MR. BRYAN ANSTEY: What I have to say concerns the two maps of Buckinghamshire: one showing where there have been planning refusals, and the other where there have been permissions granted. It seems to me that Mr. James passed too quickly over the reasons for granting the planning allocations. Would he agree that the reason why there are so many black spots on the refusals plan is because industrialists and others who want to develop, and have got to develop somewhere, are pushed out of one

county, and therefore make an application in an adjoining one? So that, very much like a housing list, we get a large mass of refusals all over the country—everybody going on to the next county to try and get in somewhere? Secondly, Mr. James mentioned unemployment difficulties and economic frustrations. Would he not agree that a great many of the economic frustrations arise from the sheer cost of getting permission for development? From this battle between the land authority and the man who wants to develop?

THE LECTURER: I agree with Mr. Anstey that there is double counting in those black, refusal areas, both in the Green Belt around Birmingham and also around London. Any man wanting to build might make two or three applications, expecting to be refused at first. That, however, does not invalidate the real point I want to make, which is that planning authorities are quite determined, no matter how many applications they get, to stand firm against development which in their view is going to spoil the Green Belt. The story of the map is probably not statistically accurate; but the principle it is demonstrating is fair enough. On the second point I cannot quite understand Mr. Anstey. I was talking of our national problem: we have to weigh how much money we shall invest in this or that, how rapidly we shall go ahead with expansion which may lead to inflation, or how far we shall restrain new investment by measures such as the 7 per cent bank rate which may lead to unemployment.

MR. L. N. FRASER (Deputy County Planning Adviser, Essex): I hope you will be tolerant with me. This does not begin as a question but I will frame it as one. The whole country is more or less covered by Development Plans, most of them approved already or about to be approved, and they forecast the future development of those parts of the country for the next fifteen or twenty years. The public dilemma in this is, that these County Development Plans are taken seriously as plans which will be implemented substantially in the form in which they are approved by the Minister, and therefore people expect to be able to build homes or carry out other development or buy land in certain parts of the country without fear of something growing up around them, as a result of a Cabinet decision overlaying the County Development Plan. Milford Haven is an example of what I mean. The steel works are another: they are probably going to be sited in areas which the plans show as white areas, that is, where no substantial development is to take place, or even in a Green Belt. Now this is a serious issue so far as it affects public confidence in the Town and Country Planning. I do not know the answer myself, but perhaps Mr. James could suggest one.

Is it inevitable in our expanding economy, when land requirements are so great, that the Cabinet should say to the planning authorities, 'You must approve this development', or 'You must not do this, because in the national interest these County Development Plans must be amended'—as it were to-day—'by the establishment of a big oil refinery at Milford Haven' or steel works somewhere else, and so on? How often one hears people ask why there is not a national plan which could be handed down to the local planning authorities. Ideally the plan for Pembrokeshire should have shown that there was going to be an oil refinery at Milford Haven. Well, we all know now why that development has been accelerated, although I suppose anyone with eyes to see and who read the national Press could have forecast that one day there would be an oil refinery at Milford Haven because of its location and physical suitability. It is rather like forecasting the bank rate. Obviously, in time, someone would build an oil refinery at Milford Haven and obviously someone will want to build a steel works in another part of the country. The question in many laymen's and planning committees' minds is, why cannot these things be forecast and discussed, rather than handed down from the Cabinet as very urgent national decisions that overlay the County Development Plan, thereby and to that extent reducing public confidence in what the plan says and means?

THE LECTURER: I wish I knew what was going to happen. But how can anyone foresee, for several years ahead, a decision, for example, which might be taken by an American company as to whether or not it should increase its imports of oil into this country from the Middle East? These decisions are taken by boards of industrialists, who may consider a certain course of action for six months or six years, decide that the financial market is just right, and then go ahead because they have a broad vision that we shall need fifty per cent more power in this country within the next ten or fifteen years. That may be good enough for them. They can see their way clearly and may transmit their decision to their engineers, who very privately go around and pick the best sites for their purpose. Now it is only at that stage, when they determine on their site and begin to find the capital for it, that the Treasury and the various government departments get to know. We have not, in this country, a planned economy, by which investment for major new industrial works comes from Treasury funds. It does not. It comes mainly from private sources. We could not possibly have advised Pembrokeshire to prepare a Development Plan in 1947 which envisaged that in ten years or so Esso would go to the north bank and B.P. to the south bank of Milford Haven; that B.P. would pump its oil sixty miles to Llandarcy and that Esso would refine on the spot, and that allowance should therefore be made for 2,000 workers on the north, but no allowance whatsoever for workers on the south. It is quite impossible to do that. If all investment in this country were controlled rigidly we might be able to look ahead more confidently. But we do not exercise this control, and we cannot possibly foretell what decisions are going to be taken by different groups of directors in different large companies twenty years ahead, or what new needs or inventions will come about. It just is not arguable.

What one can say is that there is a train of events which can be observed. It is quite clear that certain areas have a potential for major industrial development. In Essex, along the estuary shore, lies land vital for industrial purposes of some kind in the future. It might not be needed in 1960 or in 1970 in the first Development Plan. It might not even be needed in 1990, but it may be needed in the year 2,000-and-something. The potential is there to recognize. Mr. Fraser's job, I suggest, is to recognize the potential and safeguard it by not allowing the kinds of development which do not need to use that waterfront. It is safeguarding action, in such cases, that the Development Plan must be based upon. You can still have policies in relation to a Green Belt, and in relation to trends of population moving out of towns. The policy of compactness is not influenced seriously by these big industrial questions, and the Development Plan is a guide, a signpost pointing in the direction which you hope your committees will follow in determining planning applications put before it. But if some cataclysmic change, such as a big steel works or an oil refinery, comes along, the whole basis of the Development Plan is so completely changed that you have to think afresh, and you therefore make an entirely new Development Plan, such as the one Mr. Price of Pembrokeshire is busy on at the moment. Not even the best brains in the country could have advised him in 1947 what shape and form his 1958 plan was going to take. It is false thinking to suppose otherwise.

THE CHAIRMAN: Mr. James has made us aware, perhaps as never before, of all the threads that have to be interwoven to make the tapestry of our country in the twentieth century. He has shown us the conflict among the weavers, the verdant threads of green belts and national parks being overlaid by the red and grey of bricks and concrete unless battle is entered into by those responsible for the shuttles. In times past, a tapestry was conceived by an overriding mind. In a democracy one rather misses this overriding mind! We must endeavour to replace it by a united 'people's' mind, fostering individual interest, concern and knowledge among all sections of the community. Mr. James has said criticism is essential, but let it be well informed and constructive. He has helped all of us, I think, to be both these. We have had our eyes

opened to the achievements of our century—too often hidden by the dark shadow of two world wars and the threat of a third—we have been reminded of what tremendous benefits have accrued to very many people in this rather awe-inspiring century.

To-day, though some of the questions implied doubt of it, we have realized that the concern of planners is not only for industrial development but also for beauty and dignity, and for the preservation of the rural scene. They are not the absolutely determined and ruthless characters overriding our rural beauties that we sometimes imagine them to be. There is a great need for the composite mind of democracy to impart to the designers of the tapestry the overriding conception that will make it balanced yet varied, a picture of usefulness and prosperity as well as of beauty and serenity; in fact, to foster the spiritual and aesthetic values referred to by Mr. James. If we go away from here thinking together, and not in conflicting camps, we shall best express our thanks to him.

The vote of thanks to the Lecturer was carried with acclamation.

SIR STEPHEN TALLENTS (a Member of Council of the Society): I have the pleasant task of moving a vote of thanks to our Chairman. I do so as one who lives in the Green Belt of London, in the Thames Valley, in a house about one hundred yards distance from a gravel pit, at present a lake, which is being reclaimed by soil excavated from the Dartford Tunnel. Generally speaking, I should not say that the control by the Chair of meetings held in this room is among the more exacting tasks of our modern life; but a subject which has ranged from the thousand million miles range of the Jodrell Bank telescope to the prospect of a good night's sleep in Little Tew does require more control than the ordinary discussion! However, just as there are prima donnas in the world of opera, so there are stars among chairmen—and chairwomen. We at the Royal Society of Arts—not for the first time—recognize Lady Brunner as one of them; and I invite you to endorse our verdict.

The vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

THE SECOND INDIAN FIVE YEAR PLAN

The Henry Morley Lecture by

GEOFFREY TYSON, C.I.E.,

Secretary, The India, Pakistan and Burma Association,

delivered to the Commonwealth Section of the Society on Thursday, 27th February, 1958, with Sir Percival Griffiths, C.I.E., I.C.S.(retd.), in the Chair

THE CHAIRMAN: To anyone who has been connected with the affairs of India for any length of time it would always be a privilege to preside over a discussion about India's great national plan, but in my case to-day the privilege is specially great because our speaker, Mr. Tyson, has for a long time been a valued colleague of mine. Those of you who know India well will require no introduction to him, but as there may be some here who are not familiar with his background, I should like to say one or two brief words about the kind of experience which has fitted him pre-eminently to deliver his lecture to-day.

For many years Mr. Tyson was editor of what most of us regard as the best economic journal in India, and in that capacity he laid the foundation of a wide and deep knowledge of India's economic problems. During the last war he played a very important part in the organization of war publicity under difficult and, indeed, adverse circumstances. (I have only one criticism to make of Mr. Tyson in that capacity, and that is that he introduced into Calcutta that modern abomination, the loud-speaker van. I cannot say much about that, because I took a leaf out of his book and introduced it myself in Bombay in the following week!) When Mr. Tyson had finished his work for the organization of war publicity, he entered what we then called the European Group, that is to say the British Group in the Indian Legislative Assembly, of which I was a member at the time, and he very quickly established himself as our economic mentor. Mr. Tyson returned to England some years ago and became connected with the India, Pakistan and Burma Association, the body to which practically everybody who has commercial interests in India, Pakistan or Burma belongs. He is joint adviser to that body, and in this City he is regarded by all people with business connections in India and Pakistan as the leading authority on their economic problems. So Mr. Tyson has had a long period of contact with India's problems at all levels, official, non-official, Indian, British, and he is therefore better fitted than anybody that I know to give you an account of India's great Five Year Plan.

The following lecture was then delivered:

THE LECTURE

India's Second Five Year Plan has run into a certain amount of trouble; I shall hope to examine the reasons for this later on in this paper. Meanwhile, although I expect most of you are familiar with what I may call the dimensional assumptions of the plan, I propose briefly to recapitulate them as a convenient starting point for our discussion this afternoon. Furthermore, I shall hope to

show that the main reason why the Plan has begun to meet with heavy weather is largely attributable to over-optimistic calculations of the country's capacity to carry through a multi-dimensional economic plan of formidable proportions. I do not blame my Indian friends for having perhaps planned on too ambitious a scale; for no operation of the magnitude of India's Second Five Year Plan could be carried through without allowing for a substantial margin of error, and no plan would meet the political and social needs of contemporary India if it was hedged about with all the safeguards that would make it foolproof. Only a bold, imaginative and challenging blue-print was likely to brace the country for a real take-off into economic development and, encouraged by the success of the much more modest First Five Year Plan, that is what Mr. Nehru's Government decided upon in the early days of 1956.

But first a few basic facts. The Second Five Year Plan covers the period 1956 to 1961. Its underlying assumptions are related to India's needs rather than to India's resources; it is important to remember this fact, because it is at the root of much of the trouble which has arisen in recent months. Central to the whole philosophy of India's economic planning are certain other major premises. Of these the chief ones are that inequalities of wealth and opportunity should be progressively reduced and ultimately abolished, and that what is sometimes called 'a Socialist pattern of Society' and at others 'a co-operative Socialist Commonwealth' should be established. Complementary to this is the assumption (probably correct) that, left to itself, the private enterprise sector of the economy neither could, nor would, generate sufficient savings to promote the expansion of the economy at the rate envisaged by government as necessary to deal with the chronic problems of poverty, illiteracy, disease and unemployment. Thus, the area over which government assumes responsibility for decisions in the fiscal, financial and physical spheres tends to increase steadily as the tempo of planning rises.

In spite of appearances, the machinery of planning is really quite simple. The Union (or Central) Cabinet stands at the apex of the planning organization responsible, as in all democracies, to the Indian Parliament, which by and large warmly endorses the concept of the Socialist society. The Union Government and the States (formerly Provincial) Governments are the executants of all planning decisions. But the real nerve centre of the planning machinery is the National Planning Commission, a body which consists of Members and Advisers assisted by professional civil servants, economists, statisticians and an army of lesser fry. The Planning Commission has a permanent existence and functions under the chairmanship of the Minister for Planning, though the Prime Minister himself is also *ex officio* chairman of the Commission and frequently presides at its meetings.

The Commission has no executive authority; it is a fact-finding, advisory and consultative agency but its rôle in the scheme of things is immensely important, and it is perhaps a weakness of the whole planning set-up that an organization on whose advice and recommendation policy decisions of the highest importance are taken is apparently directly accountable to neither the executive nor the

legislature. Please do not misunderstand me: no one who has seen the Planning Commission at work—as our chairman and I have on various occasions—can have the slightest doubt as to the competence, or the *bona fides*, of an extremely industrious, dedicated and sincere body of men working for few material rewards and concerned only with the good of India. They are 'back room boys' in the best sense of that rather hackneyed term and, far more than the politicians, these men are aware of the impossibility of getting a quart of development out of a pint of resources. As a matter of interest to my present audience, I might add that one of three principal Advisers to the Planning Commission is an Englishman—a former member of the I.C.S. and a Scholar of Winchester and New College, Oxford, an assurance (you will agree) that India's planning problems are approached with the intellectual respect they deserve. More importantly, I regard his occupancy of this post as evidence of the continuance of that binding spell which for the last 300 years India has cast over countrymen of ours of outstanding quality.

Now let us look briefly at the aims of the Second Five Year Plan. The chief of these is to build on the gains secured and to carry forward the development process achieved under the First Five Year Plan. The Second Plan envisages a total outlay over the period 1956–61 of Rs. 4,800 crores (£3,600 million) by Central and States Governments—i.e., by the public sector of the economy—and roughly Rs. 2,300 crores (£1,725 million) by the private sector. As a result, national income is expected to increase by 25 per cent (compared with 18 per cent in the First Plan period) which would enable income per head of population —the latter growing at the rate of from 4.5 million to 5 million annually—to be increased by 18 per cent, or from Rs. 280 (say £21 10*s.*) in 1955–56 to Rs. 330 (say £25 7*s.* 6*d.*) in 1961. Measured in these simple terms one would say the Second Plan was not a wildly extravagant dream.

The plan is heavily biased in two directions: firstly, there is a marked preponderance of effort in favour of heavy industry, especially steel and steel-consuming projects such as power schemes and transportation facilities; and secondly, it has a pronounced employment bias and offers the hope of something like 10 million new jobs to match a proportionate increase in the labour force by 1961. The following are the high spots of the various production targets which have been set:

An increase of 18 per cent in agricultural output, with an additional production of 10 million tons of food grains by 1961.

National extension and community development programmes to be extended to cover a total population of 325 million.

Twenty-one million acres of new land to be brought under irrigation.

An additional installed electrical capacity of 3·4 million kilowatts.

Output of finished steel to rise by 3 million tons, of coal by 23 million tons, of cement by 5·2 million tons and of nitrogenous fertilizers in terms of ammonium sulphate by 1·7 million tons.

The total output of producer goods is expected to go up by 150 per cent over the plan period.

Of the proposed outlay of Rs. 4,800 crores on the public sector of the Plan, only half may be said to be money in the till, or with a firm prospect of being brought into the till over the five year period in the shape of budget surpluses, government loans and contributions from public services such as the railways, etc. It is proposed that the remaining Rs. 2,400 crores (£1,800 million) should be raised by way of External Assistance (Rs. 800 crores or £600 million), Deficit Financing (Rs. 1,200 crores, £900 million) and 'Uncovered Gap' (Rs. 400 crores, £300 million). These massive figures have undergone a number of upward and downward revisions since the Plan was first drafted in 1956 in order to take account of world price movements and other factors, and I do not propose to weary you with the various arguments and statistical refinements that have been brought forth for this purpose. All that I wish to say now is that a plan of this magnitude, which relies for half its resources upon a combination of such tenuous assumptions as deficit financing and an uncovered gap amounting to 10 per cent of the whole was bound, sooner or later, to create its own crisis of confidence and a feeling of doubt and hesitation in the minds of those—both Indian and non-Indian—who on every personal ground wish the Plan well and ardently desire that it should succeed.

In his presidential address to the annual session of the Indian Congress Party, which was held at Gauhati in Assam last month, Mr. U. N. Dhebar described India's present economic difficulties as 'a crisis of growth'. In a sense he was right, though I would say that, if Mr. Dhebar is content to leave it at that, there is a certain amount of self-deception in such a comfortable phrase, which seems to imply that, given time, the crisis will resolve itself and all will be well. I wish I could share this point of view more fully. Nonetheless, it is worth looking for a moment at the quite astonishing increases that have been achieved in various branches of the Indian economy during the last ten years, much of which I would emphasize is attributable to policies adopted as the result of deliberate planning decisions. Looking first at agriculture, between 1947–8 and 1956–7, the production of rice has been increased from 21 million tons annually to 28 million tons. It is still not enough; but I think you will agree that to raise production by something like one-third in less than a decade is highly creditable. During the same period the production of wheat has been increased from $5\frac{1}{2}$ million tons to $8\frac{1}{2}$ million tons and, taking the whole of the cereal group together, output in the nine years to 1956–7 rose from 43·7 million tons to 56·2 million tons. These are impressive figures, and the target for the end of the Second Plan is 80 million tons, though the probability is that the authorities may revise this to about 70 million tons. In the field of industrial fibres the picture is almost equally striking. You will recall the Partition of 1947 severed India's two great textile industries from their traditional sources of raw material—cotton in West Punjab and jute in East Pakistan. For a time, indeed, the Indian cotton and jute mills lived in something like a state of siege, so far as their raw materials were concerned. Doubtless this experience acted as a spur towards greater self-sufficiency; but, whatever the background, the fact is that Indian production of raw cotton rose from 2·2 million bales in 1947–8 to 5·1

million bales in 1956–7, and of raw jute from 1·7 million bales to 4·2 million bales.

Turning for a moment to industrial output, the record is perhaps even more impressive. Overall, something like a 60 per cent increase has been achieved in the period between 1947 and 1957. Here are some of the major items in the account:

	Production in 1947	*Production in* 1957
Textiles	3,760 m. yds.	5,500 m. yds.
Vanaspati	95,000 tons	320,000 tons
Sugar	1,075,000 tons	2,000,000 tons
Salt	1,900,000 tons	5,700,000 tons
Sulphuric Acid	60,000 tons	165,000 tons
Radios	3,000 nos.	150,000 nos.
Sewing Machines	6,000 nos.	166,000 nos.
Bicycles	49,000 nos.	695,000 nos.
Automobiles	Nil	35,000 nos.
Diesel Engines	700 nos.	18,000 nos.
Electric Fans	160,000 nos.	486,000 nos.
Coal	30 m. tons	44 m. tons
Steel	850,000 tons	1,340,000 tons
Cement	1,400,000 tons	6,100,000 tons

The point I would wish to put to you here is that these really remarkable strides in production are proof—if proof be needed—that on the purely physical plane India can deliver the goods and that, in so far as they are directed to boosting output, her planning techniques are succeeding. They may not be succeeding enough to have caught up with the inexorable growth of population, or to fill the hungry mouths that are constantly waiting to be fed. But the trend, the sharp upswing, in production is unmistakable and unless some unforeseen calamity overtakes the country they are not likely to be reversed in those branches of industry and agriculture in which they have been established. Thus, at least some of the wheels of this cumbersome planning machine have already begun to move, and soon we shall see others turning too as the three new steel works, the heavy electrical and machinery projects, the remaining multi-purpose irrigation schemes and other great enterprises come into operation. When that takes place I believe this enormous Juggernaut, which is the Indian Second Five Year Plan, will move forward with a momentum that is irresistible, and that the country will begin to reap the rewards of its present sacrifices.

In the meantime, however, a heavy responsibility rests upon those who have to arrange the finances of this vast undertaking. In any programme of accelerated economic development (particularly one with a marked bias in favour of heavy industry) two major hazards are likely to be encountered. Heavy industrial projects such as irrigation dams or steel works require a long period of gestation before any output is forthcoming to help to absorb the additional money incomes arising from the development process. They are also generally very expensive

in terms of imports. The result is that, on the one hand, lively inflationary pressures are likely to be generated and, on the other hand, a considerable strain is likely to be placed on the balance of payments.

On the whole, and up to now, the Indian authorities have been pretty successful in keeping the spectre of inflation at bay. In 1947 the first independent Government of India inherited a fairly well developed inflation from their predecessors which was a direct result of the war, aggravated still further by the 1943 famine which swept over Eastern India. I am not suggesting that the previous British—Indian régime was indifferent to the wartime inflation; quite the contrary. But given the circumstances of India, and the methods which perforce had to be adopted to finance the Allies in the Eastern theatre of war (for which India was a major supply base), it was inevitable that there would be strong inflationary pressure on the rupee at the end of the conflict. The task of the new, independent Government was to keep such pressure in check and if possible to subdue it. That they succeeded so well in the first few years was due to a combination of good fortune and good management. Nature's bounty expressed in a sequence of good monsoons, coupled with prudent monetary policies, and the avoidance of recourse to deficit financing for practically the whole of First Plan period, enabled the authorities to hold the line so as to permit the wartime inflation to work itself out of the economy. That is the rough picture and, of course, it was not all smooth going. There were intermittent periods of strain and anxiety, but the end result was as I have indicated.

But I am concerned in this lecture with the Second Plan. It is not easy to measure inflationary trends in any country—least of all in a country in which by no means all goods and services are exchanged on a monetary basis. One has to work on such limited data as are available. And so, taking the Second Plan for as far as it has run, I find that the official All-India Working Class Consumer Price Index shows a rise of no more than 25 points between the beginning of 1956, when it stood at 132, and the end of 1957 when it was 157. If this index is to be relied upon (and I myself would think that, if it errs at all, it errs on the side of caution), the rise in the price level has not been very great, having regard to all the factors in the situation. Indonesia (with whom, I admit, it is neither fair nor perhaps very relevant to compare a peaceful and well-administered country like India) has had a 59 per cent increase in the cost of living since 1953. A real inflation implies some loss of confidence in the currency; but there has been no such thing in India, and I mention Indonesia only to show that India has not had anything approaching a real taste of a classical inflation as a result of her First and Second Plans.

Nonetheless, a slow, creeping and unchecked inflation can be very debilitating both to the individual and to the community of which he is a member. So far, the Indian masses have been able to a large degree to protect themselves against the hardships of inflation; the peasants by retaining and consuming an increasing proportion of the foodgrains which they grow, and the urban worker in industry by the greatly enhanced bargaining power of the trade unions, which have secured for the chief organized groups of workers wage increases which have

kept abreast of rising living costs. The planned economy has done much to enhance the power and prestige of Indian trade unions, whose leadership in many cases is in the hands of men a good deal to the Left of orthodox Congress Party doctrine. No: the real impact of inflation, however we measure it, has fallen chiefly on the Indian professional and middle classes, as I think our Chairman, who has made very recent inquiries into this matter, would agree, It is they who are bearing the heat and burden of any inflation there is, for they are unorganized and have no protective associations to bargain with Government and/or employers; it is they who have certain social and educational standards to maintain; and it is they from whom a democracy must mainly recruit its political leaders, its intelligentsia, its civil servants and its technocrats. Let me remind you that, in Indian terms, a member of the middle class may be head of a family drawing an income of anything from £150 to £1,000 a year, the more important qualification being that he should be of appropriate caste and social standing, neither of which are directly proportionate to income.

But if we are right in regarding injections of deficit finance as likely to be the chief cause of inflation, it is the course of the country's money supply that must be watched with care. Total money supply, by which I mean the total note issue plus bank deposits and credits which can be drawn upon, runs in India at any one time at about the level of Rs. 2,000 to Rs. 2,500 crores. I do not propose to go into the complicated technical reasons, but a heavy balance of payments deficit tends at first to neutralize an internal budgetary deficit, and to this extent well grounded monetary doctrine has, temporarily at least, been working on the side of the Indian authorities in their fight against inflation. In 1955/6, the last year of the First Plan period, total money supply was expanded by Rs. 264 crores or 13·7 per cent; in 1956/7 money supply was expanded by no more than Rs. 129 crores to a total of Rs. 2,313 crores, or by the relatively small amount of 5·9 per cent. I am not able to give you figures for the ten months of the present financial year, but I will be surprised if the increase has been much more than the modest expansion of 1956/7. My reason for saying this is that the Reserve Bank are known to have kept a pretty tight control over bank and other forms of institutional credit during the past year. The conclusion I draw from this rather superficial survey of the monetary scene is that, where they exist, inflationary pressures may be attributed to physical shortages rather than to defective monetary policies. But that does not mean that the situation is without its dangers, or that vigilance can be relaxed. Indeed, in certain circumstances it might prove much more difficult for the Indian authorities to make good physical shortages than to damp down credit and money supplies. Furthermore, we must remember that this is not a short-term problem; inflationary pulls are likely to plague the economy for as long as there is a formal development programme, and our Indian friends are already beginning to talk of a third five year plan.

I have dealt at some length, and I fear somewhat inconclusively, with the inflationary content of the Second Plan. For the remaining few moments of this talk I want to look at the impact of the plan upon the balance-of-payments and the foreign exchange position. Fortunately, this side of the picture is fairly clear

and therefore susceptible to quick interpretation. As I have already told you, the Plan presumed that a good deal of foreign aid and investment would be forthcoming and that the drafts on India's foreign assets—held almost entirely in London in the form of Sterling Balances—would be of moderate dimensions; that, in fact, they would not be drawn down by more than Rs. 200 crores (£150 million). Unfortunately, neither of these assumptions has proved correct; indeed, the course of events in the first two years of this Second Plan have once again shown the dangers of counting your chickens before they are hatched, especially if they are being incubated in such a chancy thing as an economic development programme.

Take first the case of India's foreign assets, or the Sterling Balances as I shall henceforth call them. As at 1st April, 1956, the date on which the writ of the Second Plan began to run, they amounted to Rs. 746 crores (£559½ million); a year later they had fallen to Rs 527 crores (£394½ million) and on 7th February of this year—the latest date for which I have figures—they had fallen to Rs. 271 crores (£202½ million). So that in roughly one year and eleven months of the Second Plan, India has used up Rs. 475 crores of her sterling balances, or more than twice the sum estimated to be spent under this head during the whole five years of the Plan period. About fifteen months ago the authorities saw the danger that was looming up and a number of stringent measures—including a draconian slash in imports of consumer goods—were taken. These have certainly resulted in slowing down the drain on India's sterling balances during recent months, but they have not solved the problem of how India is to achieve an austere but working margin of foreign exchange for the future. One can go very wrong in forward projections of foreign exchange probabilities, and sundry countries have shown that they can get along, rather uncomfortably, on the proverbial 'smell of an oil rag' for foreign exchange. But they are not countries half way through an ambitious development plan, and I will content myself by saying that in this particular instance I am not very happy at the Indian foreign exchange prospect as one sees it at this moment.

It is arguable that there was a time, not so very long ago, when the Indian authorities might, if they had gone boldly about the task, have raised by foreign loans at least a proportion of the foreign aid and investment they now so badly need.† The unfilled foreign exchange gap for the remainder of the Second Plan is estimated by the Finance Ministry itself at roughly Rs. 700 crores (£525 million) That figure is arrived at after pruning the Plan to what the late Finance Minister has called its hard core, and taking credit for all normal receipts of overseas earnings. That the gap should be no nearer being filled two years after the start of the Plan, suggests to me that there has been an absence of forward planning of the foreign aid and loans programme which from the beginning the planners regarded as indispensable to their schemes. India's quest for foreign assistance,

†The Indian Government's total foreign indebtedness amounted to Rs.221·32 crores at the end of 1957: i.e., World Bank, Rs.82·04 crores; U.K. Government, Rs.1·96 crores; U.S.S.R., Rs.12·85 crores; Federal Germany, Rs.13·16 crores and U.S.A., Rs.111·31 crores. (Deputy Finance Minister's statement in Lok Sabha, 18th February, 1958.)

in one form or another, has in fact been intensified at the very moment when there has been a hardening of money rates, a growing shortage of international liquidity and some contraction of world trade. After all, in an ordinary business concern which requires capital for development, the prospects and possibilities of raising the necessary funds in the market are the subject of intensive and expert study for months—sometimes years—ahead. Timing is of the essence of the operation. How much more is involved in the case of a nation which is going forth as an international borrower and backing its credit abroad for the first time! Yet little seems to have been done to prepare for the day when, on the planners' own assumptions, this large foreign exchange gap would require to be bridged.

It is true, of course, that India has secured some substantial loans from the World Bank* and other international institutions, but a quick glance at the latters' balance sheets would show that they could not provide all the external finance needed for the Plan. It is possible that the large Sterling Balances which India carried on her books for so long induced a false sense of security and the illusion that they would last much longer than in fact they have. It may be that, when it came to the point, the Indians were reluctant to put their external credit to the test. Whatever the explanation, the fact is that they have left the filling of this foreign exchange gap to a moment when they are in very real danger that what they can raise from sources overseas will prove to be both too little and too late.

As it is, it seems to me that India will have to follow a somewhat opportunist borrowing programme abroad, and that even if it is successful it will perpetuate an air of uncertainty and chance in those parts of the Plan which depend for their fulfilment upon large drafts of foreign exchange. Long-term, this cannot make for smooth working and confident planning. But in the circumstances 'opportunism', in the sense that I have indicated, seems inevitable and indeed has begun. A small dollar loan (225 million) has recently been negotiated with the U.S.A., the use of a Russian credit has been brought forward, negotiations for credits with Japan and West Germany are in hand, legislative sanction has been taken to reduce drastically the minimum statutory holding of Sterling Balances as cover for the note issue, import of capital goods for the private sector is only sanctioned on the basis of extended credits and the use of foreign exchange for private purposes by Indian nationals is severely rationed. Once the foreign exchange situation was appreciated, our Indian friends tackled it with the vigour and realism one has come to expect of them. The measures I have just described will go some way towards filling the gap, and we will hope that in the remaining three years of the Plan fresh opportunities will occur for India to ease her foreign exchange difficulties; though I am bound to say that in my own opinion those difficulties seem likely to persist for as long ahead as one can reasonably foresee.

But whatever its deficiencies and defects, this Second Indian Plan will go down to history as a bold and courageous attempt to activate a great scheme of

*India is the IBRD's largest single customer and has received loans from the Bank amounting to $360 million.

economic growth inside the framework of freedom and democracy. It may fall a little short of some of its larger objectives; but, if so, it will be a brilliant failure and, in the sense that is raising the standards of life and making millions of our fellow human beings more conscious of their great potentialities, it is already succeeding. No one who has known, as I have, both the old India and the new, can have the slightest doubt about that. There is a final point, and it is this. Planning is to-day very much the vogue in the new nations of Asia and Africa. All these newly independent and emergent territories have something to learn from this daring Indian experiment, as have all of us in the West. Indeed, we have a very real interest in its progress and, as one who ate India's salt through many good years, it is my sincere hope that my Indian friends will find a happy issue out of all their present troubles.

DISCUSSION

THE CHAIRMAN: We have listened to an extraordinarily balanced survey of India's Second Five Year Plan, a survey in which Mr. Tyson has not minimized or exaggerated the failures and the successes of the past, nor the hopes and fears of the future. It is worth while remembering just how difficult it is to achieve such a balance; for on the one hand you have the undoubted fact that the plan has provided a dynamic impulse which is visibly carrying India forward to-day, and on the other hand the equally undoubted fact that an understandable element of impatience and overhaste has led India recently into severe foreign exchange difficulties from which she is not likely to recover quickly.

I should just like to mention three factors on which Mr. Tyson touched, but which he did not have time to develop. The first is the rather worrying fact that what is perhaps India's greatest problem, the problem of unemployment, is not going to be solved by the Second Five Year Plan. One of the most disturbing aspects of that plan is that the planners themselves regretfully recognize that middle-class unemployment in particular will be on as great a scale at the end of it as it was at the beginning. Another rather worrying aspect of the plan is in respect of the food situation, and here India deserves a great deal of sympathy. It is rather ironic that the one field in which India has been supremely successful is also the field in which she is in very great difficulty. Her expansion of food production has been a great triumph, achieved not by grandiose schemes, but by getting down to the business of teaching people to grow more food. It has been a tremendous success, but in spite of that success India to-day is in as great a need of importing food as she was ten years ago. The planners themselves rather optimistically hope that there will be an increase of production of fifteen million tons by the end of the period of the Second Five Year Plan. I do not think that many experts outside the planning commission regard that estimate as realistic. I certainly do not. I am much more inclined to accept the estimate of the Ashok Meta Committee that ten million tons is about the maximum increase that can be expected and that, therefore, for the foreseeable future India will still have to go on importing food on a considerable scale.

Against those two rather depressing factors may be set the very obvious rise in the general standard of living. I do not base that statement on facts and figures so much as on observation. I do not know, for example, whether an expansion of the wireless industry from 3,000 sets to 150,000 sets should be regarded as progress or not, but as I go round the towns and the villages I am conscious the whole time that people are better fed, and that there has been a greater rise in their demands and in the efforts to fulfil those demands in the past ten years than in any previous period in

Indian history. That is a tremendous tribute we all have to pay to the achievement of a self-governing India.

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G., M.C. (Chairman, Commonwealth Section Committee): When Mr. Tyson opened his most interesting analysis of the economic aspects of the Second Indian Five Year Plan by saying that it had run into some difficulties, I asked myself whether this was a typical English understatement, and I rather expected that a gloomy picture was going to be presented to us. This expectation was soon dispelled by the encouraging things our lecturer told us; particularly that in the decade following Indian independence rice production had been increased by one third, and that in the industrial field the picture is almost equally striking. Mr. Tyson reminded us that India's planning techniques are succeeding, and that the Second Five Year Plan will move forward with gathering momentum. He warned us, however, that the Indian Finance Ministry had estimated the unfilled foreign exchange gap at about £525 millions in 1961—which I think is about one-third of the sum which Great Britain spends in defence every year. And this brings me to my question. Could this gap in foreign exchange not be bridged by the United States and Great Britain acting together, even at the risk of lowering their own standards of living? May I also ask Mr. Tyson if he would expand his reference to the range of Indian middle-class incomes, which he said were from £150 to £1,000 a year. £150 strikes me as being a little low, at any rate in comparison with middle-class incomes in other countries.

THE LECTURER: Taking the second question first: it is most difficult to define the middle classes in India, and in the presence of some of my Indian friends, I do not propose to attempt to do so. We in this country are apt to think of our middle classes in terms of education, social status and so on. That does not quite apply in India. It is perfectly possible for the clerk in one's office, living on, let us say, 150 or 200 rupees a month (which seems, translated into terms of pounds, shillings and pence, a very small remuneration) to be of the necessary social standing, of the necessary caste, of the desired educational background, to qualify as middle class. When I put those figures into my lecture I was, quite frankly, only hoping that they would be reasonably accurate—but I would not like to dogmatize.

With regard to your first question: if America and Britain were to get together to fill this foreign exchange gap, in theory there is no reason why they should not do it. But I think one has to remember that India is only one of about fifteen countries with vast development programmes, all of them crying out for capital—capital, incidentally, which will not be very highly remunerated—and crying out for it on conditions which they themselves have laid down. I am always a little suspicious of this sort of capital issue. I think it was Mr. James Griffiths, the Deputy Leader of the Labour Party, who said the other day that what we have got to do is to devote about one per cent of our national income to helping the underdeveloped countries. That is a very laudable sentiment, but just how is it all to be calculated? How is it to be shared out?

India has got some help from America already this year, as you know; and for each of the remaining years of the Second Five Year Plan she can look forward with some confidence to arranging loans, so long as they do not raise too many political issues.

MR. H. F. QUILLE: I cannot quite understand how with this vast industrial enlargement, the number of middle-class employed will not increase more or less *pro rata*, even allowing for further mechanization. Would Mr. Tyson clarify that point? Secondly, I wonder if India has not done the right thing in using sterling balances rather than going into the open market when rates are obviously high? I have a very great admiration for the Indian merchants, whose knowledge is very long established, and I believe they can foresee that the regular interest on their loans in two years' time will be half as much as it would have been two years ago.

THE LECTURER: Not all these vast public works and projects produce a proportionate amount of employment. For instance, one of the main developments in the last few years has been the establishment of three new oil refineries. Now their cost was of the order of £50–£70 million. An oil refinery is a very necessary thing, it has a high capital content, but it gives employment to very few people. I made some inquiries into this question some time ago and, taking account of incremental factors where population is concerned, and of the mixed pattern of development, I do not think that you can expect an increase in employment opportunities directly proportionate to your investment all the time.

About sterling balances: don't misunderstand me; I do not for a moment suggest that India has used her sterling balances unwisely, she has put them to good use in first-class development projects. She has not spent them on Cadillacs and swimming pools and other things which are familiar in some parts of the Middle East. When I said the Indian authorities had not planned how to fill the foreign exchange gap, I meant that they knew as well as anybody else that there would be such a gap, and they knew that they were going to use their sterling balances a good deal more quickly than they had originally anticipated. Now they obviously had to supplement those with something, and I believe there was a time two or three years ago, when we were still in the middle of a long bull market, when India could as a government have borrowed abroad in a straight way. That opportunity has for the moment been lost.

MR. STEPHEN GARVIN: Could Mr. Tyson give us his opinion as to what the impact on the foreign exchange situation is likely to be of the coming into production of the three new big steel plants? India now spends a great deal of foreign exchange each year on imports of steel. That necessity will cease, and there may even be a further improvement if she becomes an exporter of steel herself. That may take some years to happen, but it does suggest that, although she will have a foreign exchange problem on her hands for the next fifteen or twenty years, the present crisis is likely to be the worst crisis. No doubt there are more to come, but this is really the worst time, while these new steel plants are being built.

THE LECTURER: I would agree, subject to one or two qualifications. The Indians themselves have said that they regard the fiscal year 1958/59 as the apex of their crisis. I think, however, they are being a bit over-optimistic on this subject of steel exports, just as I think they were a little too optimistic about this very large wad of sterling which they inherited in the form of sterling balances from 1947 onwards. They are tending at the moment, to say in effect, 'Well, of course, once we get these steel works going we will have taken the rough edge off of this crisis.' They imported last year 1,300,000 tons of steel, I think, which is a very great deal.

MR. GARVIN: At what cost?

THE LECTURER: I should not like to quote a figure, but it was a very large amount. It is true they will save that, but they go on to say (this is with all respect to my Indian friends here), 'Of course we are going to earn foreign exchange. Once we have got an output of six million tons of steel then we are going to sell steel all over the world. Also, with any luck, we shall be exporting oil before very long.' Well, those seem to me rather rash expectations at this moment. I imagine that they are going to find the running-in period for their three new steel works a good deal more difficult and protracted than they had originally calculated. I remember some time ago Mr. Tata told me that when they look back on the early days only now do they realize just how long it took them really to get themselves established technically, quite apart from price factors. I think the three new government steel works may very well take much longer to run in, and to produce steel commercially, particularly steel for export, than our friends in Delhi imagine.

THE RIGHT HONBLE. LORD PETHICK-LAWRENCE, P.C.: The Indians claim to be organizing their village life with two main objectives: one of bringing a greater degree of co-ordination into agricultural activity, and the other of encouraging what you might call home industries. I should like to know whether the production of home industries has reached a point where it can have any real economic value, or whether it is still mostly on paper.

THE LECTURER: I am very suspicious of this idea of cottage industries. I think one has to remember, however, that it is a political necessity. The Indian Cotton Textile Industry is being severely handicapped in certain ways in order to bolster up the cottage industry—the hand spinner and weaver—in the South of India. But it is a political question from which I do not think the Government of India can escape. I myself am very doubtful as to whether this emphasis on rural industries, particularly in the Second Plan, is really going to produce any worth while results.

LT.-GENERAL SIR THOMAS HUTTON, K.C.I.E., C.B., M.C.: I wonder if our lecturer has considered the possible effects of a severe recession, which is obviously quite a possibility at the present time, mainly as a result of what is happening in the United States? It occurs to me that this would probably make it easier to get credits, because people will want to keep up their exports of manufactured goods. On the other hand, I do not know what effect it would have on India's own balance of trade and whether India would feel it very severely if there is a continuing fall in commodity prices and a gradual reduction in world trade.

THE LECTURER: I am a little doubtful of the assumption, which I hear not for the first time now, that if there is a recession India would find it easier to get extended credits. I do not think it is going to be possible to sell that idea to the American Congress, whose first reaction to a recession in the past has been to close up their defences and not to export goods on especially liberal terms. I am not so sure that India is really going to be affected too much by a drop in the price of primary products. I have not worked out the proportions or the figures, but my suspicion is that India's export trade is increasingly taking the shape of manufactured and semi-manufactured goods. For instance, she is no longer an exporter of raw jute, or of raw cotton. She is in fact a net importer from Egypt and East Africa. I think the pattern of her export trade is changing, and to that extent I am not so very apprehensive that the fall in prices, in so far as it is restricted to primary products, will affect India a very great deal. But any general contraction in world trade will obviously make her present difficulties greater.

THE CHAIRMAN: It is now my very pleasant duty to express your thanks to Mr. Tyson for his admirable address. I have spoken already about his gift for taking the balanced view. I think his gift of lucidity is equally remarkable. I suppose most of us (certainly myself) still regard economics as the dismal science. Mr. Tyson has the faculty of making it not dismal; and, what is even more remarkable from my point of view, while I am listening to him he makes me at least think that I begin to understand it. I have heard a good many talks and read a good deal that has been written about the Five Year Plan, but I think tonight has been the most lucid and intelligible exposition of it that I have yet heard or read.

The vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman upon the proposal of Sir Selwyn Selwyn-Clarke, the meeting then ended.

GENERAL NOTES

'ART IN CRAFTSMANSHIP' EXHIBITION

Though British craftsmanship has maintained its old reputation for excellence, there is a tendency abroad, especially in the United States and Canada, to overlook the achievements of this country in the field of modern design—partly, perhaps, because they have not hitherto been presented on a sufficiently striking scale. In comparison with the Scandinavian countries for example, or with Italy, Great Britain is too often thought to be a specialist only in traditional modes of expression.

In an imaginatively conceived attempt to eradicate this impression, an exhibition of 'Art in Craftsmanship' has been assembled, on private initiative and a non-profit making basis, for showing in North America. It will draw attention to the post-war achievements of a thriving nucleus of British artist-craftsmen who are well grounded in design and who consciously use new techniques and materials. Because of the great and developing American interest in church building, particular stress has been laid on work which is religious in inspiration. For instance, much of the stained glass and engraved glass from Coventry Cathedral will be shown. The exhibition will also include examples of recent work in ceramics, sculpture, metal-work, book-binding, enamels, embroideries, tapestries, rugs and wood-carving. Established and celebrated artists such as Sir Jacob Epstein and Henry Moore are to be represented, together with those whose work is less well known.

The final selection has been entrusted to a committee which includes Lady Casson, Mr. Charles Gimpel, Mr. John Piper and Sir Gordon Russell. Among the sponsors of the exhibition are the American Ambassador to this country, Mr. John Hay Whitney, the Earl of Bessborough, Sir Kenneth Clark and Sir John Rothenstein.

The exhibition, which is under the patronage of Her Majesty The Queen, will be opened at the Smithsonian Institution in Washington, D.C., by the British Ambassador, Sir Harold Caccia, on 1st January, 1959, and thereafter shown at a number of American and Canadian museums. The Smithsonian Institution has undertaken to pay the entire dollar expenses involved in circulating the exhibition within the United States, but a considerable sum in sterling is needed to meet other heavy costs. An appeal for £10,000, recently launched by 'British Artist Craftsmen, Ltd.', the company responsible for the venture, has met with a generous response from those who believe that this enterprise can bring not only encouragement to British artists, but enhanced prestige and a new market for trade.

SUMMER EXHIBITION AT KENWOOD

This year the summer exhibition at the Iveagh Bequest, Kenwood, is a double one, comprising paintings and drawings by Allan Ramsay, and a display of Leeds Creamware—a form of earthenware, first made about 1760, and given a cream appearance by means of a lead and calcined flint.

Allan Ramsay, one of the earliest members of this Society, was Painter-in-Ordinary to George III. In recent years there has been a growing appreciation of his skill in portraiture, but it is not possible to judge his work fully from the isolated examples in public collections. The present exhibition brings together a number of important and less familiar paintings which are in private ownership. Of particular interest is the loan by the Marquess of Bute of four pictures, which include portraits of the third Earl of Bute at Kenwood (a house he once owned) and of Mrs. Elizabeth Montagu, the bluestocking. Mr. Alistair Smart, author of *The Life and Art of Allan Ramsay*, has advised on the selection of pictures and prepared the catalogue.

The double exhibition is open daily from 10.30 a.m. (on Sundays from 2.30 p.m.) until September.

'THE FACE OF THE FIRM'

Under the title 'The Face of the Firm', the Design and Industries Association is proposing to hold in London, early in 1959, a small, selective exhibition of firms' house styles. The aim of the exhibition will be to show by example the contribution good house style is making to British industry. Fellows who have material which they would like considered for possible inclusion should, without delay, get in touch with the Secretary of the Design and Industries Association, Mrs. Mary Harvey, at 13 Suffolk Street, London, S.W.1, or with the organizer of the exhibition, Mr. Alec Davis, of Spearhead Services Ltd., 47 Reeves Mews, W.1.

STUDIES IN THE SOCIETY'S ARCHIVES

The Society's collection of archives for the first period of its history, from its foundation in 1754 to its incorporation by Royal Charter in 1847, has now been put in order and indexed. The provenance of the collection is described in an article printed below, which is the first of a series to be published at intervals under the general title of *Studies in the Society's Archives*. The series will include contributions from specialists who find fresh evidence for their subjects amongst the Society's archives. Articles already completed include, as was mentioned in the May *Journal*, an account of the Society's association with the Lunar Society; a study of the ideas of economic and social policy expressed by the Society's early correspondents, and an analysis of the Society's interest in paper-making in the eighteenth century.

Those interested in consulting the Society's archives are invited to communicate with the Curator-Librarian, who has compiled the following introductory article.

I. The Origin and Growth of the Society's Archives 1754–1847

From its foundation the Society accumulated archives. It received them in the form of correspondence addressed to it and it made them by recording its own proceedings in minute books, account books, membership lists and volumes of transactions. At Rawthmell's Coffee House on 10th April, 1754, 'orders were given for buying one book for entering the minutes of the proceedings of the Society, also another book for entering the letters or proposals to the Society and the answer given to them, and a guard book to hold the letters'.[1] The knowledge of this event is itself supplied by the Minute Book, which is the first of a complete set still preserved by the Society.[2] The contents of the Guard Book have certainly survived. Extant books of letters received do not begin until 1767, of letters sent until 1770.[3]

In its first notice 'To the Publick', the Society invited 'any Information or Advice that may forward this Design for the publick Good' to be 'communicated by letter'.[4] The response to its invitation was extensive and long lived. The pressure of work on William Shipley, the founder and first Secretary, in the early months of the Society's existence, must have been considerable. On 24th April, 1754,[5] he was asked to number all the letters he received, and in January, 1755, to see 'that a box be made to hold the papers belonging to the Society'.[7] In February he was again asked to see to the provision of 'proper books for entering the minutes, keeping the accounts and registering all affairs relating to the Society'.[7] It would appear that until that time only some of the Minutes had been 'fairly transcribed'.[8] As has already been mentioned, the Minute Books are preserved; so are the Account Books. By July either the box had ceased to be big enough or had not made its appearance, for Shipley 'was directed to make enquiry for a proper press, wherein to place the books

and papers of the Society'.[9] The 'book case with glass doors', which he purchased in August and which 'the gentlemen present well approved',[10] is unfortunately no longer to be seen. In the last month of the year he was asked to compile 'an index of the names of the correspondents, whose letters and papers are preserved in the Guard Books'.[11] Judging by the work which had to be undertaken in 1778 he does not appear to have been able to carry out his instructions.

The duty of considering letters as they arrived was taken over by a committee in 1756.[12] No Minutes of this Committee of Correspondence and Papers, as it came to be called, are available until 1760. But from that year onwards they form, together with the Minutes of the Committee of Miscellaneous Matters, which also begin in 1760, the most useful sources for studying the Society's treatment of its archives. Dr. Peter Templeman became Secretary in 1760, and during his period of office he put together what are now regarded as the first two volumes of the Society's Transactions, known as ' Dr. Templeman's Transactions'. They cover the years 1754 to 1758 and were originally intended for publication as an 'Historical Register'.[13] In 1761 the Committee of Miscellaneous Matters examined the work which Dr. Templeman was undertaking on the Historical Register and recommended that because of the 'great load of business' falling on him some other person should take on the work of publication.[14] The Minutes for 1762, however, record that Dr. Templeman was still at work on it in that year[15], and after his death in 1769 his brother found papers on his desk at home which were 'found . . . to be papers relating to the Historical Register'.[16] The first volume of Robert Dossie's *Memoirs of Agriculture and other Œconomical Arts*, which contains a full account of the Society's early history, had appeared in 1768 and had satisfied for the time being the Society's desire to publish its Transactions.[17]

Samuel More, who was to remain Secretary until his death at the end of the century, was responsible for the production of an annual series of manuscript Transactions dating from 1770 onwards which are still in the Society's possession. He undertook this work as a result of a decision taken by the Society in 1773, when they again had publication in mind.[18] This aim was achieved on a limited scale in 1778 when a *Register of the Premiums and Bounties given by the Society* was printed and distributed to members.[19] It was based on a manuscript which has not survived, prepared by Samuel More in conjunction with the Committee of Correspondence and Papers.[20]. A more ambitious scheme to produce an annual printed volume of Transactions, which was initiated in the same year and put into practice in 1783, resulted not only in the transcription of 'Dr. Templeman's Transactions',[21] but in the rearrangement and indexing of the correspondence preserved in the Guard Books in the form in which they exist to-day.

On 21st January, 1778, the Committee of Correspondence and Papers was asked 'to examine the state of the Society's papers'[22] and ten days later it duly 'ordered that an index be made containing a comprehensive description of the subject matter of each paper now in [the] . . . Guard Books, and of all that are otherwise preserved in the Society—that all the papers be numbered beginning with the number one, and the same numbers be marked to the corresponding descriptions in the index'.[23] A special officer, Mr. James Dunn, was appointed in March to assist the Secretary in this immense task.[24] From a letter which Dunn afterwards wrote, it would appear that the contents of the Guard Books had not only to be indexed, but rearranged in chronological order. Modern archivists will sympathize with his *cri de coeur*:

> It is well known to the Committee of Papers, and likewise to many more honourable and worthy members of the Society what a confused heap of papers I had the sole trouble to select into their annual dates; though my best endeavours and strictest care was in a manner eluded, by several smaller

> bundles, being placed within the larger ones, of different dates and years, months and days, by which means the index of the Society's papers, so far as they are selected may seem to members on inspection (who seldom attend) to want that care and assiduity, which the nature of the business required, which was impossible to avoid unless the whole papers had been first selected in their annual, monthly and daily dates, doing which the Society's Great Room had been too small to have answered the purpose. Notwithstanding the office of the Assistant Secretary during my attendance in that duty, eighteen months has taken up a great deal of my time, I have nevertheless by great assiduity, care and attention to the other part of the duty, selected twelve folio volumes of the Society's papers, as well as far advanced in the second volume of the index . . . for all which I have received no more than a small pittance of thirty pounds per annum.[25]

The two volume index remains, and it contains abstracts of the contents of eleven Guard Books covering the years 1754 to 1766. Another, unindexed, volume goes down to 1767 and two more include material from 1759 to 1779.[26] The index was approved by the Committee in May, 1779,[27] and from then until February, 1780,[28] its Minutes show that it carried out a detailed examination of the contents of volumes I to X of the Guard Books with the intention of publishing them. This project, however, was abandoned in favour of publishing annual volumes of *Transactions*, and the first of these was issued in 1783. The manuscript volumes of the published volumes of the *Transactions* remain, but no further attempt seems to have been made to index letters received until the second half of the nineteenth century,[29] and to the letters which had not been considered fit for the Guard Books were added all those which were not to be published in the *Transactions*. This collection, now known as the Loose Archives, includes some 5,000 items, of a date earlier than 1847, when the Society was incorporated by Royal Charter. The work of filing it and preparing a card index to it was begun in 1954 and has just been completed. The lists which are given below are intended to be only a brief guide to the scope of the collection.

D. G. C. A.

1. [*Royal*] *Society of Arts Minutes* (hereafter *Soc. Min.*) 10th April, 1754. The Society's first meeting had been on 22nd March. In all quotations from manuscripts, spelling, capitalization and punctuation have been modernized.

2. The Minute Books of the Society date from 1754, of its Standing Committees from 1758. There are Minute Books for the Committees of Correspondence and Papers for the years 1760 to 1845 and for the Committee for Miscellaneous Matters from 1760 to 1845.

3. In 1756 the Secretary was again asked to 'purchase a book to enter copies of all the letters that have heretofore been ordered to be sent by the Society' (*Soc. Min.*, 21st July, 1756). There are four bound volumes containing copies of letters sent for the years 1770–1850 and the same number for letters received for the years 1767–78.

4. William Shipley, Notice *To the Publick*, London, 15th June, 1754.

5. *Soc. Min.*, 24th April, 1754.

6. *Soc. Min.*, 10th January, 1755.

7. Ibid., 19th Feb., 1755. The Society's Account Books and Membership Lists date from this year (1755).

8. Ibid., 2nd April, 1755.

9. Ibid., 16th July, 1755.

10. Ibid., 6th and 20th Aug., 1755.

11. Ibid., 10th Dec., 1755.

12. Ibid., 14th April, 1756. 'A committee was appointed to meet once a fortnight to take into consideration all letters from time to time sent to the Society.'

13. Sir H. Trueman Wood, *A History of the Royal Society of Arts* (London, 1913), p. 328.

14. [Royal] Society of Arts, *Minutes of the Committee of Miscellaneous Matters* (hereafter *Min. Comm. Misc.*), 4th June, 1761.

15. Ibid., 1st Feb., 1762.

16. [Royal] Society of Arts, *Minutes of the Committee of Correspondence and Papers* (hereafter *Min. Comm. C. & P.*), 19th Dec., 1769.

17. Vol. II of Dossie's work appeared in 1771 and Vol. III in 1782. See Sir H. Trueman Wood, op. cit., p. 330.

18. *Soc. Min.*, 28th April, 1773. The Secretary was to prepare an 'historical Register of the transactions of the Society from the time of his appointment to his office in order for publication'.

19. See D. Hudson and K. W. Luckhurst, *The Royal Society of Arts, 1754–1954* (London, 1954), pp. 377–84 for a list of the Society's publications.

20. *Min. Comm. C. & P.*, 15th Nov., 1777.

21. *Min. Comm. Misc.*, 26th May, 1777.

22. *Soc. Min.*, 21st Jan., 1778.

23. *Min. Comm. C. & P.*, 31st Jan., 1778.

24. Ibid., 7th March, 1778.

25. *Royal Society of Arts, Loose Archives*, B4/41 Dunn, 2nd June, 1779. Dunn had to wait until 1780 before he received his fee—it was £7 10s (*Soc. Min.*, 12th Jan., 1780). The delay was caused by the dishonesty of the Collector, who gave a cheque which could not be honoured. (*Min. Comm. Misc.*, 13th Nov., 1779.)

26. The Guard Books contain 1,947 items. An index to Volumes XII, A and B has recently been prepared. Extracts from the Guard Books were published in the Society's *Journal*, Vol. LXXXVI, pp. 283–4, 312, 333–4, 352–3, 383–4, 434–5, 606–7, 878–80. Their contents were described in K. W. Luckhurst, 'The Society's early days: new light from its correspondence': *Journal*, Vol. CII, pp. 292–312. See also D. Hudson and K. W. Luckhurst, op. cit., *passim*.

27. *Min. Comm. C. & P.*, 30th May, 1778.

28. Ibid., 26th Feb., 1780.

29. There is some evidence to suggest that loose letters may have been kept in bundles in some form of chronological arrangement. Many of them carry an endorsement stating the name of their author and their subject. When the work of indexing began, however, little remained of a contemporary storage system.

LOOSE ARCHIVES (1754–1847)

Select List of a Hundred Correspondents

(The names of these correspondents can all be found in *The Dictionary of National Biography*. The dates are those of the first, and in some cases, of the last, letter(s) which they wrote to the Society.)

Adam, James (1772)
Adam, Robert (1790)
Adam, William (1790)
Arkwright, *Sir* Richard (1782)
Anstruther, *Sir* John (1789–97)
Bacon, John (1784–96)
Baker, Henry (1756–9)
Banks, *Sir* Joseph (1797–1818)

Barlow, *Admiral Sir* Robert (1808)
Barrington, *The Honble.* Daines (1783)
Barry, James (1777–1804)
Bayley, Thomas Butterworth (1778–99)
Bedford, *6th Duke of* (1828)
Bell, *Lieut.* John (1791–4)
Boringdon, *2nd Baron* (1808?)
Boulton, Matthew (1799)
Brereton, Owen Salusbury (1788)
Briggs, John Thomas (1807–8)
Buchan, *11th Earl of* (1786)
Chalmers, George (1788)
Cleeve, Bourchier (1756)
Cockings, George (1777–95)
Copley, John Singleton (1793)
Cradock, Joseph (1787)
Cubitt, William (1844)
Dancer, *Dr.* Thomas (1790–1804)
Darwin, Charles (1841)
Darwin, Erasmus (1799)
Dempster, George (1785)
Derby, *13th Earl of* (1841)
Dircks, Henry (1843)
Dundonald, *9th Earl of* (1804)
Eden, *Sir* Frederic Morton (1797)
Egremont, *3rd Earl of* (1798)
Elmes, James (1804)
Ewbank, Thomas (1815)
Farrington, *Gen. Sir* Anthony (1796)
Fletcher, *Sir* Henry (1792–9)
Fletcher, Joseph (1843)
Fordyce, *Sir* William (1785)
Fraser, John (1788)
Gray, George (1805)
Green, Valentine (1772–99)
Green, *Lieut.* William Pringle (1823)
Griffiths, Ralph (1788)
Haliday, William (1803)
Hanway, Jonas (1759)
Harriott, John (1788–9)
Hawkesbury, *1st Baron* (1790)
Hawkins, Francis (1842)
Heathfield, *1st Baron* (1788)
Holliday, John (1794–1801)
Holt, John (1790–95)
Hume, James Deacon (1796)
Hume, Joseph (1810)
Jenour, Joshua (1777)
Johnes, Thomas (1799–1809)
Kerrich, *The Revd.* Thomas (1787)
Macdonald, *Col.* John (1810–12)
Manby, *Capt.* George William (1843)
Mann, *L'Abbé* Theodore Auguste (1780)
Maskelyne, Nevil (1788)
Mason, Charles (1759)
Masquerier, John James (1799–1804)
Melville, *Gen.* Robert (1795–1802)
Montagu, Elizabeth (1770)
Newton, Francis Milner (1759–88)
Normanby, *1st Marquess of* (1841)
Northumberland, *2nd Duke of* (1802–1806)
Oglethorpe, *Gen.* James (1778)
Paine, Thomas (1789)
Peel, *Sir* Robert, *Senior* (1806)
Pinchbeck, Christopher (1776)
Richardson, John (1785)
Robinson, William (1760)
Roche, *Sir* Boyle (1783)
Royle, John Forbes (1846)
Saunders, John (1843)
Scott, Helenus (1787)
Shaw, John (1844)
Sinclair, *Sir* John (1794–1817)
Steele, Joshua (1775–86)
Tatham, *Col.* William (1801–4)
Telford, Thomas (1790)
Thomason, Edward (1797–1823)
Tomes, John (1845)
Twining, Richard, *Junior* (1844)
Vallancey, *Gen.* Charles (1802–10)
Varley, Cornelius (1839–44)
Wale, Samuel (1759)
Walter, John (1784–8)
Warington, Robert (1846)
Watson, Richard, *Bishop of Llandaff* (1789–96)
West, Benjamin (1796)
Whitbread, Samuel (1786)
White, Charles (1799)
Whitefoord, Caleb (1785)
Whitworth, *Sir* Charles (1772)
Wright, *Sir* James (1786)
Young, Arthur (1783–1802)

LOOSE ARCHIVES (1754–1847)

Select List of Subjects Arranged under the Relevant Committees

1. *Committee of Agriculture.* The cultivation of winter fodder for cattle, which was one of the leading agricultural developments of the period, is illustrated by claims

for rewards for cultivating clover and turnips (1772–1807).* Some printed as well as manuscript descriptions tell of the spread of 'drill husbandry' (1765–99). Letters relating to attempts to cultivate hemp in England (1774–1808)—a more traditional form of agricultural improvement—include an expression of approval from the Committee of the Privy Council for Trade and Plantations. Letters also relate to problems connected with sheep-raising (1785–1806), and to the encouragement of afforestation (1779–1828). In 1785 a letter conveyed the King's interest in a chaff-cutting machine.

2. *Committee of Chemistry.* The use of coke for iron smelting, though originating in the early seventeenth century, was still an imperfect process in the middle of the eighteenth. Accounts of experiments (1756–84) sponsored by the Society are therefore particularly valuable. Letters relating to experiments with dyes (1760–1812) and varnish (1760–1848) contain samples of cloth and silvergilt which retain their original brilliance. The preservation of ships' hulls by chemical means was the subject of correspondence (1759–87). There are also letters relating to the problem of smoke abatement (1774–1843), finding a substitute for yeast (1786–1802) and keeping water fresh (1792–1806).

3. *Committee of Colonies and Trade.* An extensive collection of certificates and affidavits relating to the cultivation of raw silk (1755–65) and the production of potash (1760–7) in North America is interesting both as evidence of the working of the old Colonial System and as a source for the names of contemporary colonists. There is also material relating to the cultivation of the mango tree (1784–95) and bread fruit (1786–99) in the West Indies.

4. *Committee of Correspondence and Papers.* Letters from foreign correspondents and societies in Europe and America, and from British societies, form the largest and most interesting part of this collection. There are, in addition, certain letters concerned with the printing of the Society's *Transactions* which have a bearing on an incident in political history. Thomas Wilkins, the printer of Vol. II (1784), Vol. IV (1786),† Vol. V (1787) and Vol. VI (1788) of the *Transactions*, was engaged by Lord George Gordon to print a libellous *Petition from the Prisoners at Newgate to Lord George Gordon* (1786). His letters to the Society tell the full story of his own and his employer's subsequent prosecution.

5. *Committee of Manufactures.* The technological progress of the textile industry, perhaps the central feature of the Industrial Revolution, is reflected in a collection of letters (1758–1846). The manufacture of paper (1764–90) and leather (1785–95), shoemaking (1778–1806) and the fishing industry (1796–1818) are also illustrated. Letters relating to poor relief (1756–1818) are full of interest to the student of social policy. There are some beautiful samples of black silk lace made by pauper girls in Marylebone (1775).

6. *Committee of Mechanics.* Under this heading have been placed nearly half the entries in the Subject Index. This total reflects the predominance and miscellaneous character of the Committee's work. The term 'mechanical' was used in its most literal sense, and a simple list of all the topics which were so described would be too long for inclusion here. It is possible, however, to divide the Committee's MSS. into five main categories and to give them separate consideration.

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* The dates refer to the earliest and latest letters respectively.

† Vol. III was printed by John Walter on his logographic press.

(*a*) *Power and Production*. The various stages in the application of motive power to industrial production (which was such an important feature of British economic development during the late eighteenth and early nineteenth centuries) are illustrated by letters and drawings of windmills (1769–96), steam engines (1768–1843) and watermills (1773–1810). Improvements in engineering design and tooling are shown in correspondence about saws and sawmills (1759–1815), harpoons (1774–92) and pumps (1783–1842). Firearms large and small (1772–1823) are shown in drawings and designs—some fanciful and some that worked.

(*b*) *Transport and Communications*. A large number of letters concerned with carriages and carts (1764–1841) give details of technical problems in horse-drawn vehicles, and provide evidence of road accidents. A less extensive collection relates to experiments with road maintenance (1788–1820) and railway improvements (1810–45). Transport by water—on sea, river and canal—is illustrated in letters concerned with the construction of ships and barges (1775–1845). A few letters refer to ballooning and other forms of air travel (1783–1837).

(*c*) *Humanitarian, Medical and Safety Devices*. There are letters bearing on both the humanitarian and technical aspects of chimney sweeping (1790–1842). Medical material ranges from unpleasant exercising machines (1785–96) and surgical saws (1815) to important discoveries in dentistry (1798–1845). Artificial limbs (1806–44) and trusses (1810–12) also concerned the Committee. Many forms of sea rescue (1763–1847) and of fire fighting and precautions (1772–1842) are illustrated, as is ventilation (1787–1847).

(*d*) *Domestic Improvements*. Under this heading may be considered a varied assortment of letters which give a good picture of the day-to-day life of the people of the time. There are attempts to solve the problems of heating (1786–1824), lighting (1786–1842) and sanitation (1793–1846). But minor matters such as door fastenings (1768–1820), gates (1791–1801), garden chairs (1810) and umbrellas (1823) do not go unnoticed.

(*e*) *Scientific Instruments and Calculations*. Letters describing various aspects of clock making (1776–1845) and the construction of telescopes (1791–1823), sundials (1791–1845) and barometers (1796–1844) illustrate the development of precision instrument making. Attemps to produce perpetual motion (1772–1842) and to square the circle (1779–94) are shown in letters, descriptions and drawings. There are also letters concerned with weights and measures (1775–1842).

7. *Committee of Polite Arts*. The work of this Committee in connection with young artists (1759–1843) is illustrated by a large collection of certificates of age, and of the authenticity of drawings, paintings and sculpture. Correspondence about cartography covers the years 1759 to 1842. The Committee was also interested in the prevention of forgery (1799–1824).

8. *Society*. Under this heading can be found letters and memoranda which are of especial value as a source for the domestic history of the Society. The development of the various executive offices is particularly well illustrated. There is material relating to the Secretaryship (1760–1839), the Collectorship (1777–1844) and the Assistant Secretaryship (1779–1816). A considerable number of letters relate to arrears of subscription and the inquiries from members about the administration of the Society.

OBITUARY

We announce with regret the deaths of a former Vice-President, and a Fellow, of the Society.

MR. H. W. SANDERSON

Mr. Harold William Sanderson, a former Vice-President and Member of Council of the Society, died on 4th June, aged 94.

Harold Sanderson was for many years the leading figure of Arthur Sanderson & Sons, Ltd., the wall-paper manufacturers, which, under his guidance, developed an enviable reputation. He was also responsible for the creation of the Sanderson Fabrics factory. By experience he was thus in a position to appreciate the special problems which arise in the relationship between the designer and industry, and during his association with the conduct of the affairs of this Society—which began in 1932 and lasted, with one interval, until 1942—he made these problems his special concern. He was a member of the former Art Schools and Industry Committee, progenitor of the present Industrial Art Bursaries Board, to which he also belonged, from its inception in 1938 until the outbreak of the Second World War.

Sanderson was firmly convinced that the aspiring young designer should early be brought into contact with industry; and that the best way of achieving this was by undergoing a course of purposeful instruction in the factory before proceeding to an art school. He gave forceful expression to this view in a paper read to the Society in 1933, when he also described the system of training which he had initiated in the Sanderson works at Perivale. In the years which followed, and also after his retirement from the Council, he made many contributions to the Society's meetings, always speaking with particular cogency when the subject had to do with the place of the artist in manufactures and commerce, or with the teaching of art. In 1935 he gave £100 to supplement an offer, by the Council, of prizes for essays on 'Training Art Students for Industry and Commerce'.

The objects of this Society made a strong appeal to Sanderson: in return he gave not only his time, judgment and money to promote its work for industrial design, but exercised all his influence most successfully to attract support in the form of new members.

The Harold William Sanderson Art in Industry Fund has been established in his memory to provide help for artists at the beginning of their careers, in perpetuity.

DR. CHARLES PENROSE

Dr. Charles Penrose, Chairman of the Newcomen Society in North America, and a Vice-President of the (British) Newcomen Society, died in Pennsylvania on 17th May, aged 72.

Of Cornish descent, Penrose was born in Philadelphia, and educated there, in Germany, and at Princeton University, where he obtained the B.Sc. degree in 1907. He was then trained as an electrical engineer. In 1917 he joined the well-known

consulting engineers, Day and Zimmerman Inc., of Philadelphia. He was Assistant General Manager of the firm until 1932, when he was appointed a Vice-President.

Though Penrose was well known in engineering circles as a practitioner and writer, and was a prominent member of several American professional associations, it was to furthering the objects of the Newcomen Society that he devoted his greatest efforts: and in particular to promoting understanding and friendship between leading men in business and industry on both sides of the Atlantic. This was never a vague ideal to Penrose: he was tirelessly active in its pursuit, and it is not too much to assert that the degree of harmony achieved in Anglo-American relations during the difficult period of the Second World War—and since—has in large measure been due to men of his calibre.

Dr. Penrose was for some years a member of the Board of Managers of the Franklin Institute, and he shared several important characteristics with Franklin: notably a scientific temper, wide interests and the gift for friendship. Like Franklin also, Penrose found the aims of this Society, of which he became a Fellow in 1955, close to his own. He was responsible for introducing a number of distinguished fellow-countrymen to its membership, thereby further strengthening the Society's traditional links with North America.

CORRESPONDENCE

HANDWRITING: A NATIONAL SURVEY

From *Reginald Piggott, N.D.D., 10 Finlay Drive, Dennistoun, Glasgow, E.1*

About a year ago [*Journal*, 1st February, 1957, p. 223] you kindly published my request to Fellows to send me examples of their handwriting, to assist in the survey which I was carrying out. More than two hundred letters were received in response; many writers, besides giving the details asked for went on to tell me about the styles of handwriting which they were taught at school, and about the changes which occurred in later life.

The results of the survey, which was based on close scrutiny of many thousands of specimens of handwriting contributed by people in all walks of life, are now published*. They include contrasts in standards of legibility between one profession and another, types of pen, styles of handwriting preferred and also proportions of right- to left-hand writers.

There is quite obviously a movement away from the 'Civil Service' style of handwriting which involves the use of a fine flexible pen, towards a much simpler, often partly-joined hand for which is used a stub (Relief type) medium-broad pen. This type of pen effects the variation in stroke thickness, not by an alteration in pressure, but by the angle of presentation of the point.

These results obtained from the survey have helped very much in the development of a utility model hand which was its main purpose, and details regarding this are given in the second part of the published report entitled 'A Better Plan for Modern Handwriting'.

**Handwriting: A National Survey*, by Reginald Piggott (Allen & Unwin, 1958, 25s. net).

NOTES ON BOOKS

YOUNG ARTISTS OF PROMISE. *By Jack Beddington. London, The Studio,* 1957. 30*s.*

The unprecedented encouragement nowadays given to our serious young painters by critics, collectors, dealers, and curators, must be a source of envy to every aspiring poet in search of a publisher. A favourite hunting-ground for connoisseurs is the annual exhibition in London of the 'Young Contemporaries'. This year one of its student contributors has already exhibited in three leading London galleries, as well as in Liége, Brussels, and Dusseldorf, and received an Italian State scholarship. Before he is thirty—an age when considerable artists of the past were often suffering acute privation or neglect—this ex-student may very well find himself sought after and discussed in the capitals of Europe and America through the agency of the British Council.

Mr. Jack Beddington, an enlightened and untiring patron of contemporary art, is well aware of this situation, and, indeed, has himself suggested in the Press that it is the artists in mid-career who stand most in need of help to-day. Nevertheless, he has yielded to the persuasion of his friends in compiling and introducing an illustrated album which will certainly benefit a number of deserving young artists. Over a hundred reproductions of their pictures (six in colour), and a smaller sculpture section, reveal Mr. Beddington's cultivated taste inclining more to figurative than to abstract art, though not excluding some abstracted works as imaginative as the bronze birds of Mr. Trevor Bates. The anthologist is also a practical man, and the list of names and addresses of his hundred and twenty contributors at the end of the book provides a useful service.

At the same time it seems clear, that for the most part, Mr. Beddington's only guide in making his selection was the photographs—an overwhelming cascade of between four and five thousand—submitted by hopeful artists. It appears then, that the selector could not have known, in most instances, the qualities of colour, touch, and texture of paintings which might have appeared less impressive in the original than in photographs which present an arresting or unusual design. However, Mr. Beddington must undoubtedly share with this reviewer a first-hand knowledge of a number of these paintings, whose subjects are drawn (as so often to-day) from industrial and urban life, with wry glimpses of types in workshop, dance hall, and snack bar, or sitting alone in plain rooms.

The unsmiling attitude to life manifested in these plates certainly prevails to-day in art schools throughout the country. The notion of any earnest young painter emulating Hogarth's *Shrimp Girl* is unthinkable. Glumness, indeed, has become a fashion among the young, which is not easily reconciled with the relative independence they enjoy, and the ease with which so many artists of the student generation seem able to travel abroad. This sombre painting no doubt seems to them, in some vague way, appropriate to the times, though it is seldom that one senses in their canvases an underlying protest against the social order, implicit in French Social Realism since the War and American Proletarian art in the years before. Nevertheless, the benefits of the Welfare State have been sourly received in the studio.

Jaundiced, one might think, is Mr. Alfred Daniels' outlook on life, though his reproductions here are somewhat deceptive. He possesses, in fact, an alert eye for the idiosyncrasies of human nature and a sly wit, both apparent in his exhibition not long ago at Zwemmer's gallery. His workmen sitting on a bench in *Jack's Snack Bar* are acutely observed, and at the same time show Ben Shahn's influence in the cut-out forms and patterning. Another conspicuous contributor is Mr. Frederick Yates,

rightly awarded a prize recently for his glowing painting of the interior of an engineering works, showing men at work on molten metal. Most promising of all, perhaps, is Mr. Albert Herbert, still in his early thirties, and a product of the Royal College of Art. His painting of a small girl twirling on a pavement is an essay in movement which owes something to Ruskin Spear. But his more recent *Mother and Child* is entirely personal, the monochrome reproduction barely suggesting the haunting, concentrated emotion of the original. Mr. Beddington has done admirably to bring such works to more general notice.

NEVILE WALLIS

ENGLISH ROMANESQUE LEAD SCULPTURE. *By G. Zarnecki. London, Tiranti,* 1957. 15*s net*

Among the odder survivals of the English Middle Ages are a series of fonts made of lead, sixteen of them dating from the twelfth century. It is not only remarkable that they have escaped being turned into bullets; it is also curious that they should ever have come into existence. For by the twelfth century the familiar stone bowl was already normal, and surviving stone fonts of this century in England probably outnumber those surviving from any century before or since. However, the material of which a font shall be made has never been laid down; there exist on the continent a few made of bronze inspired by Solomon's brazen sea; and the lead fonts are probably cheap substitutes for bronze ones. It is, indeed, possible that they were originally gilt, though if so no trace of the gilding survives.

Dr. Zarnecki's book contains a series of particularly excellent photographs of the twelfth-century examples, of details of their decoration and of comparative material of a variety of kinds, and is prefaced by a most interesting study of their place in the history of art in England, with detailed notes on the individual examples. Interest centres in the fact that together they constitute the bulk of the surviving evidence about artistic metalwork in England at the time. As such they present a succession of problems which Dr. Zarnecki discusses briefly and reasonably, and which help to illuminate the fundamental question of the relation between English and continental art when the fonts were made. There is no doubt at all that the principal centres of the arts of metalwork in northern Europe in the eleventh and twelfth centuries lay in what was then the north-western part of the Empire. The towns one would name first are Hildesheim, Cologne and Liége. It is therefore not inherently surprising that most of the foreign comparisons adduced in the present book point to that part of the world. The only exception which looks important is deceptive. For though the font at Brookland (Kent) is clearly related to that at St. Evroult de Montfort (Normandy) and to a psalter commonly associated with Fécamp (Normandy), the psalter in fact comes from Ham in the diocese of Noyon; and the inspiration for all three objects is most probably to be sought in that region and further east.

What these stylistic and iconographic relationships imply in terms of artists and their training is, of course, the most interesting and also the most difficult of the problems set by this group of fonts. A personage who figures prominently in Dr. Zarnecki's introduction is Master Hugh, almost certainly a foreigner to judge from his name, and probably a layman, who cast the bronze doors of the Abbey of Bury St. Edmund and also illuminated a Bible in the 1140s. The famous *Schedula* of Theophilus, written some time near 1100, is proof of the existence in Germany of amateur clerical practitioners of considerable pretensions in a variety of ornamental arts at this date. On the other hand there is equally certain evidence from Germany of the existence of professional lay goldsmiths. Mr. Oman, in a very interesting review in the March issue of the *Burlington Magazine*, makes a case for the fonts

being the work of plumbers using moulds produced in the first place by goldsmiths for work in precious metals. Dr. Zarnecki on the contrary, maintains that the twelfth-century fonts are the direct work of goldsmiths and has intentionally omitted the thirteenth century and later fonts which clearly are the work of plumbers. His standpoint would have been clearer had he felt able to confine his attention to the fonts of Walton on the Hill, Wareham and Dorchester, and the Gloucestershire group. To some extent this is in any case a distinction without a difference since it is agreed that the moulds cannot have been the work of plumbers, and it is on them that the artistic quality of the final product principally depends. On either view therefore we are brought into touch with the kind of work twelfth-century goldsmiths were producing in England and have evidence with which to assess the quality of their work, and whether they were by and large native, foreign, or native but trained abroad. The sad fact remains that until the time of Cellini we are without direct information about the degrees of professional specialization and the influence on one another of practitioners of different arts in different countries, the most obscure point being the position of the goldsmith, since it is his work that has survived least well. Dr. Zarnecki has done a real service in bringing to general notice this neglected and very interesting body of evidence for the twelfth century; and it is to be hoped that many will derive food for thought as well as pleasure from his charming and erudite little book.

CHRISTOPHER HOHLER

GUIDE TO WESTERN ARCHITECTURE. *By John Gloag. London, Allen & Unwin,* 1958. 63*s net*

The first of ten chapters is entitled 'The Unwritten Record', and initiates the reader into the treasure house of knowledge which is his for the asking, if he can interpret the language of architecture. 'It is not necessary to be apprenticed to the building trade', the author says, 'in order to interpret the language of architecture. Any observant person can do so in time; but the significance of architecture cannot be learnt or understood properly from words and pictures alone; it must be supplemented and expanded by the constant study of buildings, anywhere and everywhere.' An essay follows to illustrate by examples the invisible story which the visible bricks and stones can tell the discriminating observer.

The second chapter is on 'Origins'. Here the author provides the reader with a certain amount of technical background. 'The character of architecture has been formed by three structural inventions', he says, 'and the periodic discovery and use of new materials and techniques. . . . The first structural invention was made when men found that two upright posts could support a horizontal member. . . . The second invention was the arch. . . . The third invention is based on the cantilever principle, and has been made effective by the use of steel and concrete.' The basic 'orders of architecture' are discussed, since 'Buildings in nearly every country that is included in Western civilization may trace their architectural lineage back to those three Greek orders, Doric, Ionic and Corinthian.' 'Town Planning is also brought into this chapter, as 'Both architecture and town planning are the responsibility of the architect, and in those activities the same problems and needs arise in every civilization although the scale changes.'

These two introductory chapters are followed by eight sections, each dealing with a separate period of historic architecture from 'Classical Architecture' to 'The New Western Architecture and its Origins.'

Each section I found to be an excellent introduction to the period; surprisingly

complete in essentials, considering that so much is contained in a single illustrated volume of just over 400 pages. The Bibliography at the end of the book makes it a simple matter for the reader to follow up any of the leads so ably given. I think it a pity, however, that *Architecture in the Age of Humanism*, by Rudolf Wittkower, and *The Gothic Cathedral*, by Otto von Simson, are not mentioned.

The final chapter on the modern movement is for me perhaps the most interesting. It is a splendidly lucid history of the immediate cause of the bulk of architecture to-day. For instance, to quote a passage that won my instant respect:

> Ruskin's influence as a writer and lecturer was vast. He believed with immoderate passion in the survival of Gothic architecture, and as he identified the idiosyncrasies of his personal taste with eternal principles, and could express himself in beautiful English, he was able to confuse many issues and to turn the minds of his audiences away from the world they were living in to a dream world of mediæval romance.

I found the text in general excellently written, the illustrations most helpful in their clarity, and I have no hesitation in strongly recommending this book to all who are interested in the subject.

SERGEI KADLEIGH

MEWAR PAINTING IN THE SEVENTEENTH CENTURY. *By Moti Chandra. New Delhi, Lalit Kalā Akadami*, 1957. *Rs.* 8/12/–

Those who succumbed to the spontaneity and gay exuberance of Rajasthani paintings from the collection of G. K. Kanoria that were exhibited by the Arts Council of Great Britain last year, will welcome this new monograph published by India's National Academy of the Fine Arts. Every one of the ten colour plates in this book is a blaze of colour in which the natural world is transmuted into an ideal setting. Men, birds, beasts and plants are caught up in a rhythmic dance and glow with a passion appropriate to the realm of religious myth and romantic poetry which the pictures illustrate. Four of the plates in the book are, as it happens, actually from the Kanoria collection and, along with others from Indian collections, they give a very clear impression of this virile school of painting. Pictures from Mewar predominated in the Arts Council exhibition, but there are very few examples to be seen in European collections, nor have many been reproduced in accessible publications. Thus, the Lalit Kalā monograph forms a useful memento for those who wish to become more acquainted with this charming aspect of Hindu art.

The introduction and notes to the plates have been provided by the Director of the Prince of Wales Museum, Bombay, who is greatly respected among students of Indian art history. His essay gives a very sound and straightforward account of painting in Mewar but it is written with Indian readers mainly in mind, and this may prove a minor disadvantage to those who lack the necessary background knowledge of Indian culture. However, Dr. Moti Chandra commands a very clear and concise style, and his notes to the plates throw sufficient light on the content of the pictures for there to be no barrier to their appreciation.

There is scarcely any ground for disagreement with the author's attributions and datings. The rāginī painting illustrated on plate 7 is a little out of line with the majority of Mewar pictures, but it would be difficult to suggest an alternative attribution, and the only cause for surprise is that the author appears to regard G. K. Kanoria's 1688 Bhāgavata Purāna pages as being of Mewar origin.

ROBERT SKELTON

FROM THE JOURNAL OF 1858

VOLUME VI. *9th July*, 1858

CONSOLATION PRIZE

The subjoined letter has been addressed to the Secretary of the Oldham Lyceum, with reference to an irregularity in giving out the papers in Geometry and Algebra, which prevented the declaration required by the Council, in reference to the working of the papers, from being signed in its integrity by the Local Board:

SIR,—I am directed by the Council of the Society of Arts to announce to you the decision which they have definitely taken in reference to the Oldham Candidates. The non-compliance with the regulations laid down for the guidance of the Local Boards cannot be passed over, and the Candidates are therefore disqualified from obtaining Certificates and Prizes. The Council much regret that these Candidates, from no default of their own, have become thus disqualified; but in order that the Candidates in all parts of the country may feel secure that the competition will be perfectly fair, the essential conditions which regulate it must be well known and strictly observed. They were fully communicated to the Local Board of the Institutional Association of Manchester, and the Council of the Society of Arts must support its regulations and maintain the disqualifications of the Candidates. You will probably be able to make better arrangements for conducting your Examinations at Oldham next year. The Council desire me to request you to present to No. 405, Thomas Crellin, the enclosed sum of £5, and to No. 406, Ralph Crompton, the enclosed sum of £3, as a present from this Society in token of its sympathy with the Candidates in the disappointment which they must necessarily feel.

These are the amounts which it appears from the report of the Examiners these Candidates would have received as Prizes if they had not been formally disqualified from receiving them.

I am, Sir,

Your obedient servant,

P. LE NEVE FOSTER, *Secretary*.

30th *July*, 1858

SPECIAL PRIZE

The Prize of Twenty Pounds (placed at the disposal of the Council of the Society of Arts for this purpose, by the Rev. F. Trench and J. MacGregor, Esq.) and the Society's Silver Medal, offered for a Writing Case suited for the use of soldiers, sailors, emigrants, &c., will be awarded according to the following conditions:

1. *Weight*—None will be received weighing above five ounces when empty.
2. *Size*—The size in length and breadth must not exceed that necessary to hold note paper.
3. *Ink*—The case must not contain ink in a fluid state.
4. *Durability*—It must be made of a substance not liable to be spoiled by wet, and which will protect the contents from injury.
5. *Cheapness*—The retail price, with guaranteed supply, must not exceed 1*s*. 6*d*.

Competitors are desired to take notice that the Council reserve to themselves the right of with-holding the prize should there be no article of sufficient merit brought under their notice.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 1st of January, 1859.

[The prize was awarded, in April, 1859, to Messrs. Parkins & Gotto, of Oxford Street.]

LIBRARY ADDITIONS

Fellows and Associates are reminded that they may borrow up to five books at a time from the library and retain them for a month. Members living outside London may borrow books by post. Books sent by post are despatched at the cost of the Society and returned at the cost of the borrower.

FINE ARTS (GENERAL)

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ELGAR, FRANK, *and* MAILLARD, ROBERT—Picasso: a study of his work by Frank Elgar [and] a biographical study by Robert Maillard; translated from the French by Francis Scarfe. *London, Thames & Hudson* [1956].

GAUNT, WILLIAM—Arrows of desire: a study of William Blake and his romantic world. *London, Museum Press*, 1956.

GAUNT, WILLIAM—The Pre-Raphaelite tragedy. *London, Jonathan Cape*, 1942.

GRAY, BASIL—Japanese woodcuts. *Oxford (Cassirer); London, Faber* (1957).

GOODWIN, GORDON—James McArdell. *London, A. H. Bullen*, 1903.

GOODWIN, GORDON—Thomas Watson, James Watson, Elizabeth Judkins. *London, A. H. Bullen*, 1904.

*HOGARTH, WILLIAM—The works of William Hogarth, from the original plates restored by James Heath, Esq., R.A., with the addition of many subjects not before collected: to which are prefixed, a biographical essay on the genius and productions of Hogarth, and explanations of the subjects of the plates, by John Nichols. *London, Baldwin & Cradock* [1822]. Presented by Mr. Clifford Martin.

HULTON, NIKA—An approach to Paul Klee. *London, Phoenix House*, 1956.

LEWIS, DAVID—Mondriaan (1872–1944); with an introduction and notes by David Lewis. *London, Faber*, 1957. (Faber Gallery, edited by R. H. Wilenski.)

MOSCHINI, VITTORIO—Francesco Guardi; text by Vittorio Moschini; translated from the Italian by Archibald Colquhoun. *London, Heinemann*, 1957. (Great masters of Italian art series.)

MURTHA, EDWIN—Paul Manship; with a foreword by David Finley. *New York, Macmillan. (N.Y.)* 1957.

MYERS, BERNARD S.—Mexican painting in our time. *New York, Oxford University Press*, 1957.

PIPER, DAVID—The English face, *London, Thames & Hudson*, 1957.

ROBINS, WILLIAM PALMER—How to draw bridges. *London, Studio Publications*, 1957. (How to draw series, No. 41.)

UKKONON, JORMA, *Editor*—Art in Finland. *Helsinki, Kustannusosakeyhtiö Otava*. 1955. Presented by the Applied Art Association in Finland (Ornamo).

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SMILES, AILEEN—Samuel Smiles and his surroundings. *London, Hale*, 1956.

HISTORY AND TOPOGRAPHY

BOWDEN, WITT—Industrial society in England towards the end of the eighteenth century. *New York, Macmillan*, 1925.

CARDWELL, DONALD STEPHEN LOWELL—The organisation of science in England: a restrospect. *London, Heinemann*, 1957. (Books on Sociology, edited by Donald Gunn Macrae.)

GREGG, PAULINE—A social and economic history of Britain, 1760–1950. *London, Harrap*, 1950.

HOSKINS, WILLIAM GEORGE—The making of the English landscape. *London, Hodder & Stoughton*, 1955. (The making of the English Landscape series, edited by W. G. Hoskins, No. 1.)

JORDON, HELEN *and* JORDON CLARENCE, *editors*—Benjamin Franklin's unfinished business. *Philadelphia, Franklin Institute*, 1957. Presented by the authors.

MARSHALL, DOROTHY—English people in the eighteenth century. *London, Longmans, Green*, 1956.

NATHAN, HARRY LOUIS, *1st Baron Nathan of Churt*—World aviation and geography. [*Presidential*] *Address to the Geographical Association*, 1956. (*London, Geographical Association*, 1957.) Presented by the author.

PRICE, RICHARD GEOFFREY GEORGE—A history of 'Punch'. *London, Collins*, 1957.

TAYLOR, FRANK SHERWOOD—A history of industrial chemistry. *London, Heinemann*, 1957.

TIMBS, JOHN—Abbeys, castles, and ancient halls of England and Wales; their legendary lore and popular history. *London, Frederick Warne & Co.* No date. (Re-edited, revised and enlarged by Alexander Gunn; Vol. I, south; Vol. II, midland.)

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* Books marked with an asterisk are part of the reference library and are not normally available for loan.

THE ROYAL SOCIETY OF ARTS

JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

FOUNDED IN 1754 AND INCORPORATED BY ROYAL CHARTER IN 1847

PATRON: HER MAJESTY THE QUEEN

PRESIDENT: HIS ROYAL HIGHNESS THE PRINCE PHILIP, DUKE OF EDINBURGH, K.G.

PROPOSAL FORM FOR MEMBERSHIP

Candidate's Name in full .....

Nationality .....

Address .....

.....

.....

Rank, Profession or Business .....

I desire to become a Fellow/an Associate Member of the Royal Society of Arts.

Signature of Candidate .....

Date of Birth .....

We hereby propose and recommend the above Candidate as a fit and proper person to become a Fellow/an Associate Member of the Royal Society for the Encouragement of Arts, Manufactures and Commerce.

Signatures of three fellows, at least one of whom must sign on personal knowledge :

Name in Block Capitals	Signature
[.....]	..... (*on personal knowledge*)
[.....]	.....
[.....]	.....

Read and suspended ..... Elected .....

Details of Candidate's past and present occupation, academic and professional qualifications (in the case of degrees the conferring University should be stated) and any other relevant information should be attached on a separate sheet.